SOIL SURVEY OF

Lake County, Indiana

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University
Agricultural Experiment Station

Issued July 1972

Major fieldwork for this soil survey was done in the period 1962–66. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1967. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Lake County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodland; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Lake County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with numbers on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit, special crop group, shrub group, wildlife group, and recreation group assigned each soil.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and mangement of the soils from the soil descriptions and from the discussions of the capability units and the woodland groups.

Foresters and others can refer to the section "Use of the Soils as Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreational areas in the sections "Town and Country Planning" and "Landscaping."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Lake County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "General Nature of the County."

***Cover picture:* Aerial view of an expanding built-up area in Lake County. The soils are mainly Warners silt loam and Maumee loamy fine sand.**

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Contents

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SURVEY BY IVAL D. PERSINGER, SOIL CONSERVATION SERVICE

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

LAKE COUNTY is in the northwestern corner of Indiana (fig. 1). The county is bordered on the north by Lake Michigan, on the east by Porter County, Ind., on the south by the Kankakee River, and on the west by the State of Illinois. The land area, 328,960 acres, covers about 16 miles from east to west and about 32 miles from north to south.

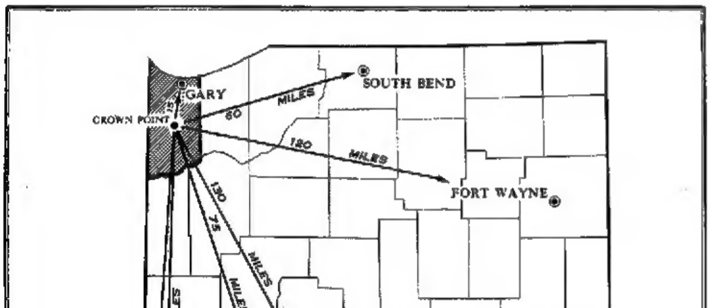

Figure 1.—Location of Lake County in Indiana.

Crown Point, the county seat, is approximately 40 miles southeast of the Chicago Loop, hub of the prime industrial center of the Midwest. Major industrial cities within the county include Gary, Hammond, Whiting, and East Chicago.

About 55 percent of the land in Lake County is highly arable and is used as farmland. A major source of revenue in the county comes from a variety of business and industrial enterprises. Many of the county's part-time farmers work in the Chicago industrial complex.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Lake County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Plainfield and Rensselaer, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Plainfield fine sand, 6 to 12 percent slopes, is one phase within the Plainfield series; and Rensselaer loam, sandy substratum, is one phase within the Rensselaer series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. Only one such kind of mapping unit, the soil complex, is shown on the soil map of Lake County.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen or hyphens. Milford-Linwood-Wallkill complex is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Lake beaches is a land type in Lake County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and game preserves, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map[1]

The general soil map at the back of this survey shows, in color, the soil associations in Lake County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Lake County are discussed in the following pages.

1. Oakville-Tawas association

Steep to nearly level and depressional, excessively drained and very poorly drained soils that formed in coarse-textured and organic materials

This association is characterized by narrow, elongated, parallel ridges separated by sloughs (fig. 2). It occurs in the northern part of the county and extends in the same general direction as its shores along Lake Michigan.

This association makes up 14 percent of the county. About 45 percent of this is Oakville soils, 45 percent is Tawas soils, and the rest is miscellaneous land types.

Oakville soils are on the ridges and are excessively drained. They have a black, coarse-textured surface layer about 2 inches thick. Below this are light yellowish-brown and pale-brown, loose, coarse-textured materials.

Tawas soils are in depressions between the ridges and are very poorly drained. Their surface layer is black, friable muck about 30 inches thick. It is underlain by grayish-brown, coarse-textured material.

The land types that make up 10 percent of this association are Dune land, Lake beaches, Marsh, and Urban land. Most of the Urban land formerly was Oakville and Tawas soils.

This association is used mainly for industry and community development. It is an area influenced by the cities of Whiting, East Chicago, Hammond, and Gary. Most of the industry in the county is on the soils of this association. Little of the association is cropland. The

[1] Assisting in the preparation of this section was ALVIN L. ZACHARY, assistant professor of agronomy, Purdue University.

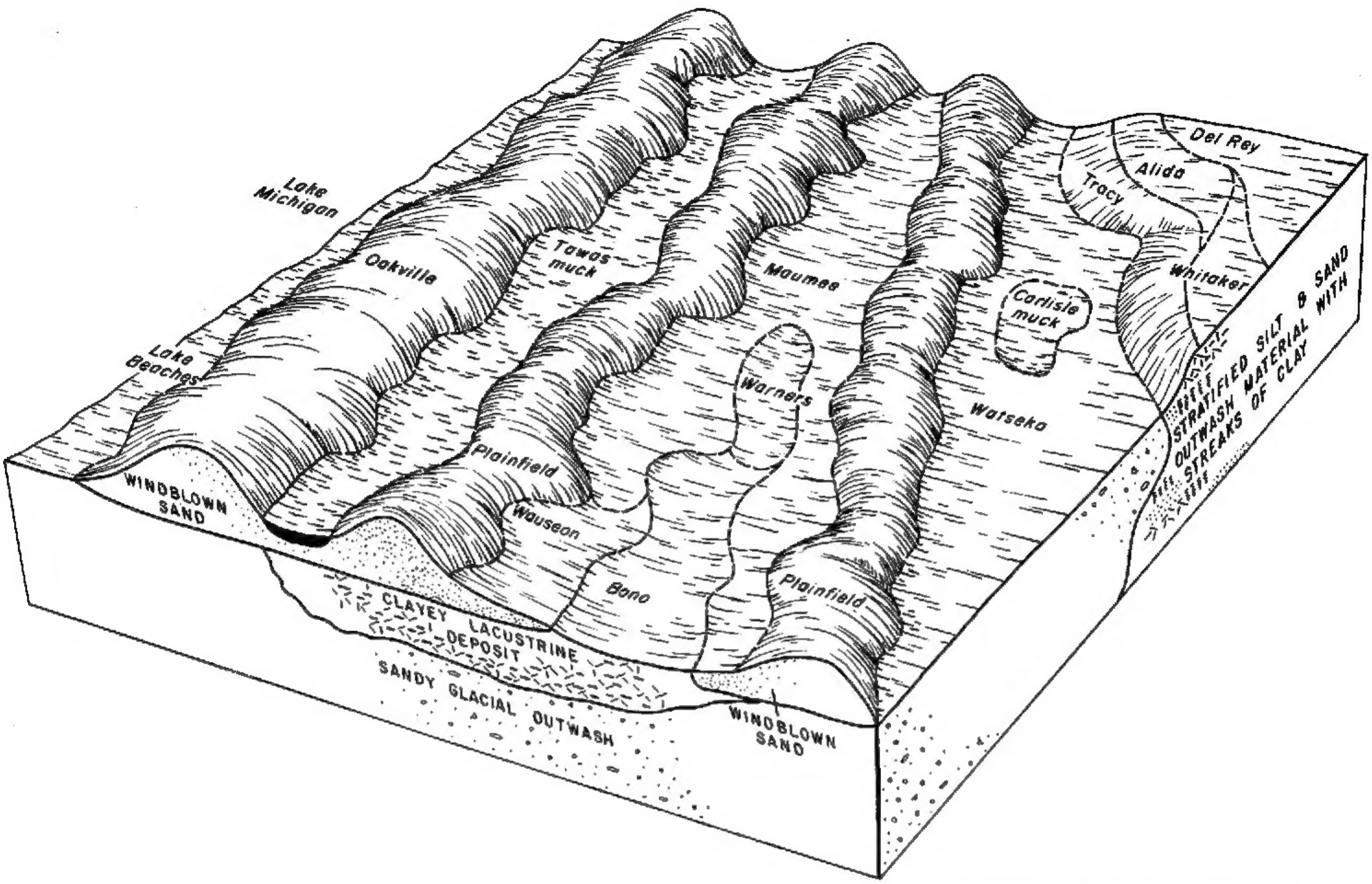

Figure 2.—**Oakville-Tawas, Plainfield-Watseka, Maumee-Bono-Warners, and Alida-Del Rey-Whitaker soil associations. The Oakville-Tawas association is on the left.**

vegetation remaining is mainly black oak on Oakville soils and swamp grasses on Tawas soils.

The main hazards to growing crops on this association are drought on the Oakville soils and wetness on the Tawas soils. The main limitations for town and country development on the Tawas soils are a high water table and ponding.

2. Plainfield-Watseka association

Moderately sloping to nearly level, excessively drained and somewhat poorly drained soils that formed in coarse-textured glacial outwash

This association is one of former beach ridges that are long, narrow, and continuous (see fig. 2). It occurs as two areas south of the Oakville-Tawas soil association. The soils consist of coarse-textured outwash material that has been reworked by wind.

This association makes up about 6 percent of the county. About 45 percent of this is Plainfield soils, 40 percent is Watseka soils, and the rest is minor soils.

Plainfield soils, on the high part of the ridges, are moderately sloping and excessively drained. Their surface layer is very dark gray and dark grayish brown, coarse textured, and about 6 inches thick. Below the surface layer is yellowish-brown and light yellowish-brown, loose, coarse-textured material.

Watseka soils occur at the base of the ridges and are nearly level and somewhat poorly drained. Their surface layer is very dark brown, coarse textured, and about 12 inches thick. Below the surface layer is mottled dark grayish-brown and pale-brown, loose, coarse-textured material.

About 15 percent of the association consists of small areas of Brems, Sparta, Maumee, and Tawas soils. The Brems and Sparta soils are on intermediate elevations between the Plainfield and Watseka soils. The Maumee and Tawas soils are in depressions adjacent to the Watseka soils.

This association is used mainly for housing and industry. In it are the cities of Munster, Highland, Griffith, Schererville, and the southern part of Hammond and Gary. A few small areas are used for special crops. The vegetation remaining is dominantly black oak on Plainfield soils and swamp grasses on Watseka soils.

The major hazards on this association are drought, soil blowing, and wetness. Because the available moisture capacity generally is very low, the soils in this association are subject to soil blowing. The Watseka soils have

a seasonal high water table. They need a suitable drainage system if cultivated crops are to be grown.

3. Maumee-Bono-Warners association

Depressional and nearly level, very poorly drained soils that formed in coarse-textured to fine-textured lake sediments

This association is in former slack water areas that lie between the beach ridges (see fig. 2). It occurs between two areas of the Plainfield-Watseka association in the northern part of the county.

This association makes up 7 percent of the county. About 45 percent of this is Maumee soils, 20 percent is Bono soils, 10 percent is Warners soils, and the rest is minor soils.

Maumee soils are deep, are very poorly drained, and are coarse textured throughout. The surface layer is black, very friable, and about 16 inches thick. The underlying material is mostly light brownish gray mottled with dark gray and pale brown. Calcareous material begins at a depth of about 39 inches.

Bono soils are deep, are very poorly drained, and are fine textured throughout. Their surface layer is black and very dark gray and is about 21 inches thick. The subsoil is gray mottled with strong brown. The underlying material is calcareous at a depth of about 39 inches.

Warners soils consist of deep, very poorly drained mineral soil material over marl. Their surface layer is black and very dark gray, calcareous, and medium textured. It is about 16 inches thick. The underlying material is gray, very friable, calcareous marl.

About 25 percent of the association consists of minor areas of Marl beds and of Milford, Carlisle, Wallkill, and Wauseon soils. The Milford and Wauseon soils are adjacent to Bono soils. The Carlisle soils are adjacent to Maumee soils. Marl beds and Wallkill soils occur next to Warners soils.

This association is used mostly for special crops. Some of the main special crops grown are potatoes, onions, cabbage, carrots, and sweet corn. Also grown are corn and soybeans.

The major hazards on this association are wetness and soil blowing. For optimum crop growth, an adequate drainage system is needed. The proper use of crop residues, use of cover crops, and minimum tillage are helpful in reducing soil blowing.

A high water table and ponding are major limitations to community development.

4. Alida-Del Rey-Whitaker association

Nearly level, somewhat poorly drained, moderately coarse textured and medium-textured soils that formed in glacial outwash and lake sediments

This association occupies somewhat poorly drained flats on glacial outwash and lake sediments (see fig. 2). It lies southeast of the most southern area of the Plainfield-Watseka association.

Soil association 4 makes up about 4 percent of the county. About 35 percent of this is Alida soils, 15 percent is Del Rey soils, 15 percent is Whitaker soils, and the rest is minor soils.

Alida soils have a surface layer that is very dark grayish brown and light brownish gray, moderately coarse textured and medium textured, and about 11 inches thick. The subsoil is mottled yellowish brown and light brownish gray, moderately fine textured, and about 33 inches thick. The underlying material is light-gray stratified sand and gravel.

Del Rey soils have a grayish-brown, medium-textured surface layer. The subsoil is yellowish brown and gray mottled with light gray and is moderately fine textured. The underlying material is gray mottled with yellowish brown and also is moderately fine textured. It contains thin lenses of coarse-textured material.

Whitaker soils have a dark-gray and pale-brown, medium-textured surface layer. Their subsoil is pale brown mottled with light brownish gray and is moderately fine textured. The underlying material is brownish yellow mottled with light brownish gray. It is stratified with moderately fine textured to coarse-textured material.

About 35 percent of the association consists of minor soils. Among these soils are the somewhat poorly drained Darroch soils, Del Rey silt loam, dark colored variant, and the well-drained Oshtemo and Tracy soils.

This association is used mainly for crops, though areas are in pasture and trees. The main row crops are corn and soybeans, but small grain and pasture plants are also grown. Cash grain is the major type of farming. Some beef cattle and hogs are raised. The expanding city of Hobart is in this association.

The major hazard on this association is wetness. A seasonal high water table is the major limitation for town and country development. For optimum crop growth, a suitable drainage system is needed.

5. Morley-Blount-Pewamo association

Steep to nearly level, moderately well drained to poorly drained soils that formed in moderately fine textured glacial till

This association occurs on upland till plains and occupies somewhat poorly drained flats, moderately well drained knolls and ridges, and poorly drained swales and narrow drainageways (fig. 3).

The association makes up about 26 percent of the county. About 50 percent of this is Morley soils, 20 percent is Blount soils, 15 percent is Pewamo soils, and the rest is minor soils.

Morley soils are deep and moderately well drained. They are gently sloping to steep and occur on knolls and ridges. The surface layer is dark grayish brown and brown, medium textured, and about 8 inches thick. The subsoil is yellowish brown and grayish brown and is fine textured. The underlying material is light brownish-gray, calcareous, moderately fine textured glacial till.

Blount soils are deep and somewhat poorly drained. They are nearly level and occur on broad flats. The surface layer is dark grayish brown and grayish brown, is medium textured, and is about 12 inches thick. The subsoil is mottled grayish brown and yellowish brown and is moderately fine textured. The underlying material is brown, calcareous, moderately fine textured glacial till.

Pewamo soils are deep and poorly drained. They are nearly level and occupy swales and narrow drainageways. The surface layer is very dark gray, moderately fine tex-

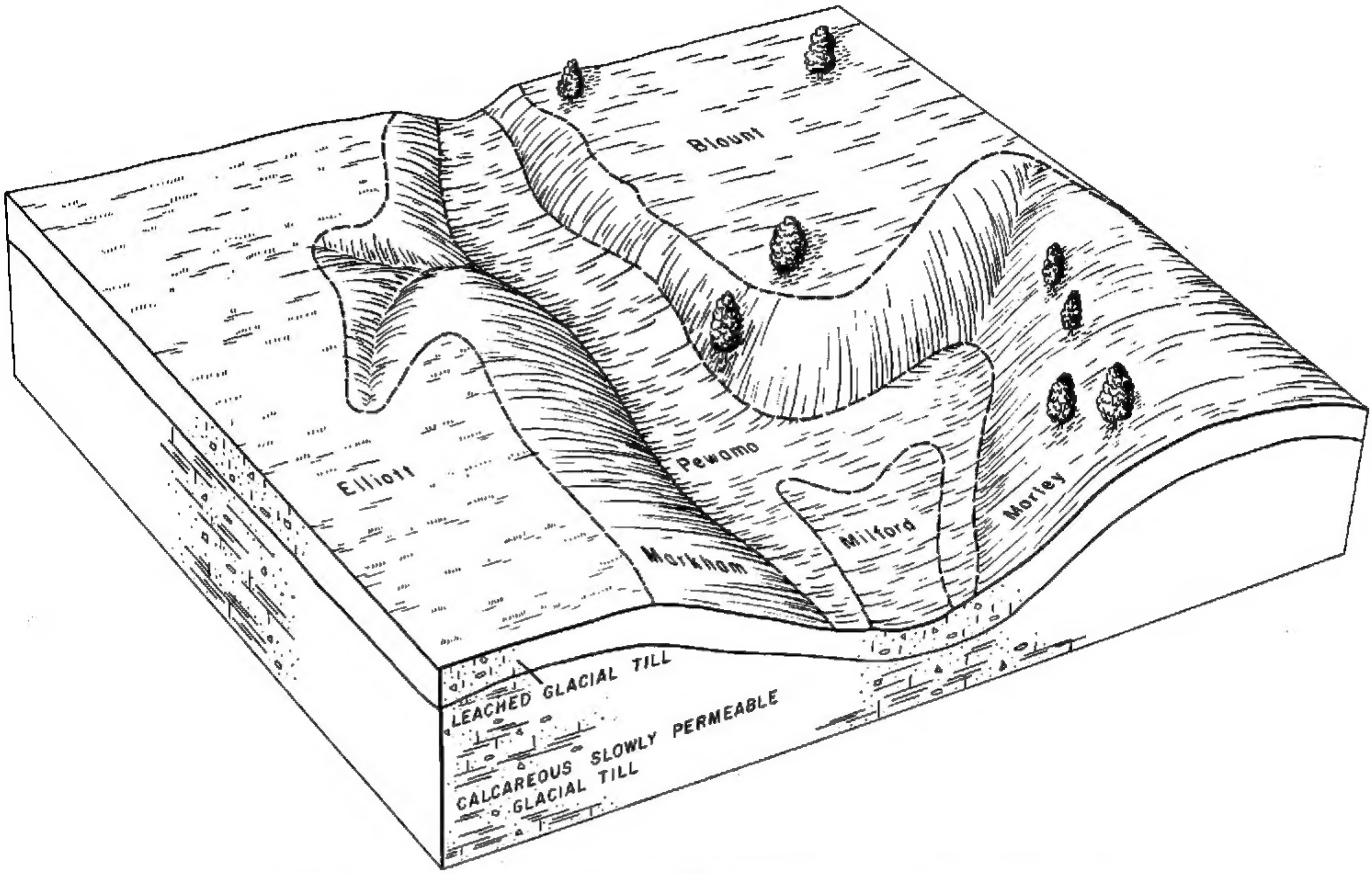

Figure 3.—Morley-Blount-Pewamo and Elliott-Markham-Pewamo soil associations.

tured, and about 15 inches thick. The subsoil is gray mottled with yellowish brown and is moderately fine textured. The underlying material is calcareous, moderately fine textured glacial till that is light brownish gray mottled with yellowish brown.

About 15 percent of the association consists mainly of small areas of Milford, Elliott, and Markham soils. Also in the association are a few small areas of Carlisle muck and Linwood muck.

This association is mainly cropland (fig. 4). The soils in much of the acreage are moderately sloping to steep. Morley soils are used for pasture and trees. The main crops are corn, soybeans, small grains, and meadow. General livestock farming is practiced in this association.

The major hazards are wetness, surface runoff, and erosion. Other concerns are maintaining organic matter and fertility and improving soil tilth. Permeability is moderately slow or very slow. For optimum crop growth, a suitable drainage system is needed on the less well drained soils. Terraces, waterways, and minimum tillage help control surface runoff and erosion on the gently sloping and steeper soils.

A seasonal high water table and ponding on the nearly level soils are major limitations to town and country development.

6. *Elliott-Markham-Pewamo association*

Nearly level and gently sloping, well-drained to poorly drained soils that formed in moderately fine textured glacial till

This association occurs on upland till plains. It occupies somewhat poorly drained flats, moderately well drained low knolls and ridges, and poorly drained swales and narrow drainageways (see fig. 3). The soils in this association developed under prairie vegetation and have a dark-colored surface layer.

This association makes up about 25 percent of the county. About 28 percent of this is Elliott soils, 25 percent is Markham soils, 25 percent is Pewamo soils, and the rest is minor soils.

Elliott soils occur on broad flats and are nearly level, deep, and somewhat poorly drained. Their surface layer is black and very dark gray, medium textured, and about 15 inches thick. The subsoil is mottled dark grayish brown and yellowish brown and is fine textured. The underlying material is grayish-brown, calcareous, moderately fine textured glacial till.

Markham soils are gently sloping and occur on knolls and ridges. These soils are deep and moderately well drained. Their surface layer is very dark grayish brown

***Figure 4.*—Oats on Morley silt loam, 2 to 6 percent slopes.**

and grayish brown, medium textured, and about 10 inches thick. The subsoil is yellowish brown mottled with grayish brown and is fine textured. The underlying material is grayish brown mottled with yellowish brown. It is calcareous, moderately fine textured glacial till.

Pewamo soils are nearly level and occur in swales and narrow drainageways. These soils are deep and poorly drained. Their surface layer is very dark gray, moderately fine textured, and about 15 inches thick. The subsoil is gray mottled with yellowish brown and is moderately fine textured. The underlying material is light brownish gray mottled with yellowish brown. It is calcareous, moderately fine textured glacial till.

About 22 percent of this association consists mainly of small areas of Milford, Blount, and Morley soils, but there are also a few small areas of Carlisle muck and Linwood muck.

This association is used mostly for crops, mainly corn, soybeans, small grains, and meadow. General livestock farming is practiced.

The major hazards are wetness, surface crusting and puddling, and surface runoff and erosion. Permeability is moderately slow or very slow. For optimum plant growth, a suitable drainage system is needed on the less well drained soils.

On the gently sloping soils, diversion terraces, waterways, and minimum tillage help control surface runoff and erosion.

A seasonal high water table and ponding on the nearly level soils are major limitations to town and country development.

7. *Rensselaer-Gilford association*

Depressional and nearly level, poorly drained and very poorly drained soils that formed in moderately fine textured to moderately coarse textured glacial outwash

This association occurs along glacial channels and in broad depressions in the outwash plain along the Kankakee River. Small isolated mounds or elongated ridges of coarse-textured material are typical (fig. 5).

This association makes up about 18 percent of the county. About 50 percent of this is Rensselaer soils, 30 percent is Gilford soils, and 20 percent is minor soils.

Rensselaer soils are deep, poorly drained, and medium textured. Their surface layer is black and about 14 inches thick. The subsoil is dark grayish brown and olive gray and is moderately fine textured. The underlying material is gray mottled with yellowish brown and is calcareous.

Gilford soils are deep, very poorly drained, and moderately coarse textured. Their surface layer is black and about 22 inches thick. The subsoil is dark gray mottled with yellowish brown and is about 16 inches thick. The underlying material is light brownish gray and coarse textured.

About 20 percent of the association consists mainly of small areas of Alida, Brady, Door, Lydick, Maumee, Oshtemo, and Tyner soils. These soils are on rises in the association.

This association is used mostly for crops, mainly corn and soybeans. If managed well, most of the soils are well suited to intensive row cropping. Other crops include small grains and meadow, and some special crops are grown. Many large commercial farms produce cash grain, beef, and vegetables.

The major hazards on this association are wetness and soil blowing. Also a concern is maintaining good tilth. A high water table and ponding are major limitations on the nearly level soils. Flooding is a hazard in some areas along the Kankakee River. For optimum plant growth, a suitable drainage system is needed.

Descriptions of the Soils

In this section the soils of Lake County are described in detail. The approximate acreage and proportionate extent of each mapping unit are shown in table 1.

The procedure in this section is first to describe a soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs. The description of the soil series mentions features that apply to all the mapping units in the series. Differences among the soils of a series are pointed out in the description of the unit described or are indicated by the soil name.

A profile typical for each series is described in two ways. Many will prefer to read the short description in narrative form. The technical description of the profile is mainly for soil scientists, engineers, and others who need to make thorough and precise studies of the soils. Colors are for moist soils unless otherwise indicated.

As explained in the section "How This Survey Was Made," not all mapping units are members of a soil series. Urban land, for example, is a land type that does not belong to any soil series. It is listed in alphabetic order along with the soil series.

Following the name of each mapping unit, there is a

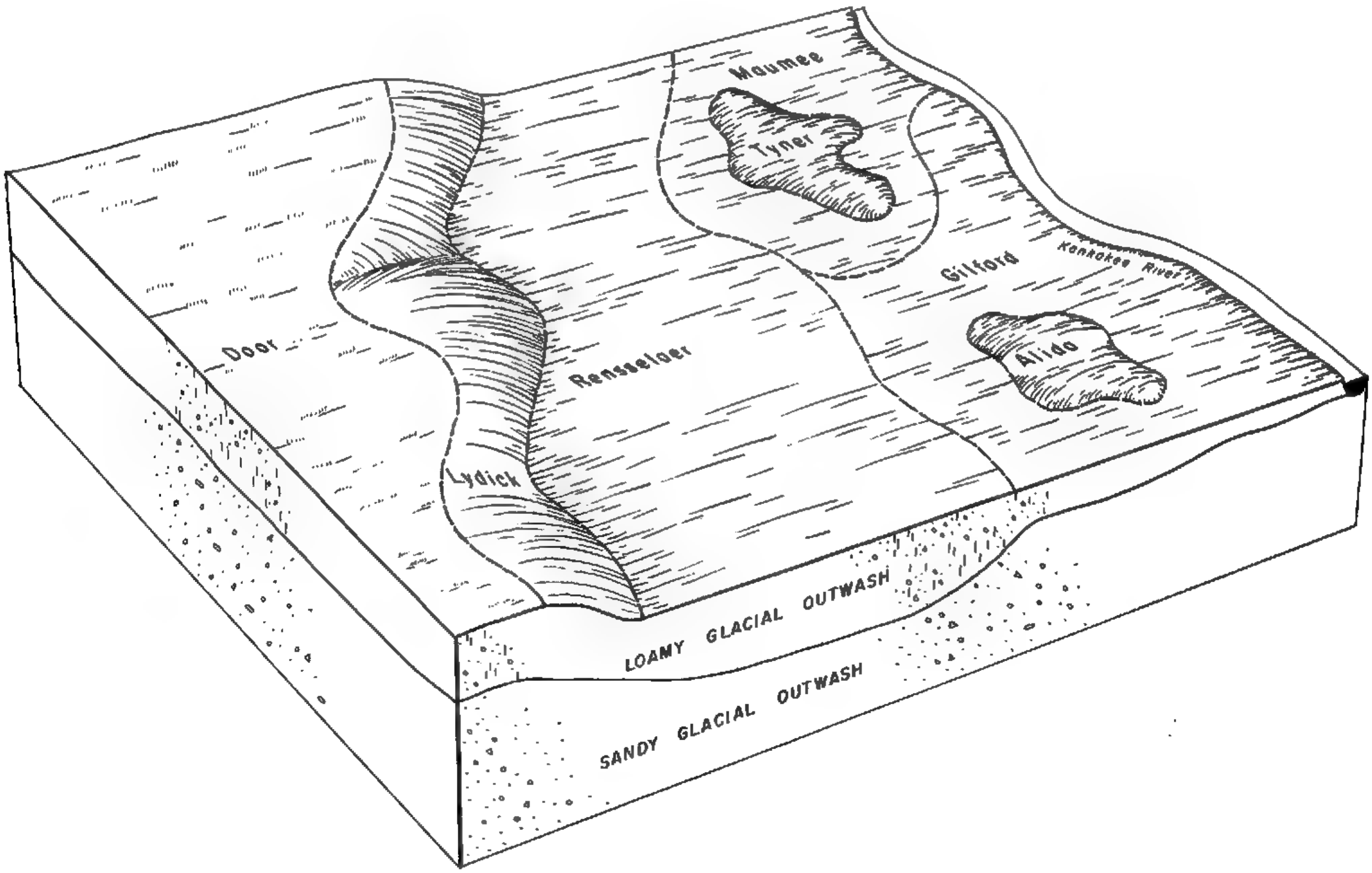

Figure 5.—**Rensselaer-Gilford soil association.**

symbol in parentheses. This symbol identifies the mapping unit on the soil map. Listed at the end of a description of a mapping unit is the capability unit in which the mapping unit has been placed. The "Guide to Mapping Units" at the back of this survey lists the pages where the capability unit, the special crop group, the shrub group, the wildlife suitability group, and the recreation group are described. Many terms used in the soil descriptions are defined in the Glossary and in the "Soil Survey Manual" (*6*).[2]

Alida Series

The Alida series consists of deep, somewhat poorly drained, moderately coarse textured and medium-textured soils. These soils occur on outwash plains and are nearly level. They formed in moderately fine textured, shaly glacial outwash. Alida soils are underlain by sandy and gravelly material at a depth of more than 36 inches.

Typically the surface layer is loam about 11 inches thick. The upper 8 inches is very dark grayish brown, and the lower part is light brownish gray.

The subsoil is about 33 inches thick and is divided into three parts. The upper 4 inches is yellowish-brown, friable heavy loam mottled with grayish brown. The middle, 15 inches thick, is yellowish-brown clay loam and shaly sandy clay loam mottled with light gray and light brownish gray. The lower part is dark-brown sandy loam.

The underlying material is light-gray, loose sand.

Alida soils are moderate in organic-matter content. The plow layer is medium acid unless it has been limed. Crops on these soils respond well to additions of lime and of a complete fertilizer. Because the water table is high in spring, a tile drainage system is needed to insure good crop growth.

Most areas of the Alida soils are cultivated. If these

[2] Italicized numbers in parentheses refer to Literature Cited, page 88.

TABLE 1.—*Approximate acreage and proportionate extent of soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Alida fine sandy loam	847	0.3	Morley silt loam, 18 to 25 percent slopes	770	.2
Alida loam	4,584	1.4	Morley silty clay loam, 2 to 6 percent slopes, severely eroded	2,241	.7
Blount silt loam, 0 to 2 percent slopes	15,100	4.6	Morley silty clay loam, 6 to 12 percent slopes, severely eroded	5,531	1.7
Bono silty clay	4,962	1.5	Morley silty clay loam, 18 to 25 percent slopes, severely eroded	1,318	.4
Borrow pits	631	.2	Oakville fine sand, 12 to 25 percent slopes	978	.3
Brady fine sandy loam	2,886	.9	Oakville-Tawas complex, 0 to 6 percent slopes	6,481	2.0
Brems fine sand, 0 to 4 percent slopes	1,651	.5	Oshtemo fine sandy loam, 0 to 2 percent slopes	1,085	.3
Carlisle muck	5,984	.18	Oshtemo fine sandy loam, 2 to 6 percent slopes	1,338	.4
Clay pits	747	.2	Oshtemo fine sandy loam, 6 to 12 percent slopes	540	.2
Darroch loam	708	.2	Pewamo silty clay loam	27,813	8.4
Del Rey silt loam	2,010	.6	Pewamo silty clay loam, calcareous variant	1,850	.6
Del Rey silt loam, dark colored variant	800	.2	Plainfield fine sand, 0 to 6 percent slopes	8,379	2.5
Door loam, 0 to 2 percent slopes	2,517	.8	Plainfield fine sand, 6 to 12 percent slopes	925	.3
Door loam, 2 to 6 percent slopes	809	.2	Rensselaer loam	1,183	.4
Door loam, silty clay loam substratum, 2 to 6 percent slopes	687	.2	Rensselaer loam, sandy substratum	24,938	7.6
Dune land	542	.2	Rensselaer mucky loam, sandy substratum	902	.3
Elliott silt loam	23,705	7.2	Rensselaer loam, calcareous subsoil variant	2,055	.6
Gilford fine sandy loam	11,754	3.6	Sparta fine sand, 0 to 4 percent slopes	3,189	1.0
Gilford mucky fine sandy loam	2,939	.9	Sparta fine sand, silty clay loam substratum, 0 to 4 percent slopes	424	.1
Gilford loam	1,995	.6	Tawas muck	4,640	1.4
Lake beaches	161	(1)	Tracy loam, 0 to 2 percent slopes	893	.3
Linwood muck	254	.1	Tracy loam, 2 to 6 percent slopes	1,201	.4
Lydick loam, 0 to 2 percent slopes	1,144	.3	Tracy loam, 6 to 12 percent slopes	532	.2
Lydick loam, 2 to 6 percent slopes	680	.2	Tracy loam, silty clay loam substratum, 2 to 6 percent slopes	304	.1
Markham silt loam, 2 to 6 percent slopes, eroded	20,483	6.2	Tyner loamy fine sand, 0 to 6 percent slopes	1,254	.4
Marl beds	1,102	.3	Urban land	34,408	10.4
Marsh	712	.2	Wallkill silt loam	1,703	.5
Maumee loamy fine sand	10,152	3.1	Warners silt loam	2,209	.7
Maumee silt loam	498	.2	Watseka loamy fine sand	6,947	2.1
Milford silt loam, overwash	9,425	2.8	Watseka loamy sand, moderately deep variant	902	.3
Milford silty clay loam	3,483	1.1	Wauseon fine sandy loam	1,383	.4
Milford silty clay loam, sandy substratum	1,885	.6	Whitaker loam	2,050	.6
Milford-Linwood-Wallkill complex	2,092	.6	Gravel pits and sand pits	143	(1)
Morley silt loam, 2 to 6 percent slopes	29,153	8.9	Water	3,134	.9
Morley silt loam, 6 to 12 percent slopes, eroded	4,909	1.5			
Morley silt loam, 12 to 18 percent slopes, eroded	3,326	1.0	Total	328,960	100.0

[1] Less than 0.05 percent.

soils are adequately drained and fertilized, they are suited to all crops commonly grown in the county.

Typical profile of Alida loam, 980 feet north and 140 feet east of SW. corner of SE¼ sec. 4, T. 35 N., R. 7 W.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—8 to 11 inches, light brownish-gray (10YR 6/2) loam that has few, fine, faint mottles of light yellowish brown (10YR 6/4); moderate, thin, platy structure; friable; very strongly acid; clear, wavy boundary.

B1t—11 to 15 inches, yellowish-brown (10YR 5/6) heavy loam that has many, medium, distinct mottles of grayish brown (10YR 5/2); weak, medium, subangular blocky structure; friable; grayish-brown (2.5Y 5/2) coatings on ped faces; very strongly acid; clear, wavy boundary.

B21t—15 to 21 inches, yellowish-brown (10YR 5/6) light clay loam that has many, medium, distinct mottles of light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; firm; grayish-brown (2.5Y 5/2) coatings on ped faces; very strongly acid; clear, wavy boundary.

B22t—21 to 30 inches, yellowish-brown (10YR 5/6) shaly light sandy clay loam that has many, medium, distinct mottles of light gray (10YR 6/1 and 2.5Y 7/2); weak, coarse, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B3—30 to 44 inches, dark-brown (7.5YR 4/4) sandy loam that has many, medium, distinct mottles of grayish brown (2.5Y 5/2) and common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/8); weak, coarse, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

IIC—44 to 60 inches, light-gray (10YR 7/2) sand; single grain; loose; medium acid.

The solum ranges from 36 to 60 inches in thickness. The A horizons range from 8 to 12 inches in thickness, and the content of sand, by volume, ranges from 30 to 60 percent. In some places where the B horizons contain thin strata of sandy loam, the IIC horizon is stratified sand and gravel.

Alida soils have a finer textured solum than Brady soils. The A horizons of the Alida soils are lighter colored in the lower part than those of the Darroch soils, which are underlain by stratified silt and sand. The A horizons in the Alida soils are darker colored, the B horizons more acid, and the C horizon sandier than corresponding horizons in the Whitaker soils, which are underlain by calcareous, stratified silt and sand.

Alida fine sandy loam (0 to 2 percent sloeps) (Ad).—This soil has a profile similar to that described as typical for the series but has a fine sandy loam instead of a loam surface layer.

Included with this soil in mapping are small areas of soils that have a loam or silt loam surface layer. Also included in some places are areas of Brady fine sandy loam and of Rensselaer loam. Other inclusions are a few small areas of coarse-textured soils that are more droughty than this soil and that, in some places, are underlain by silty clay loam glacial till at a depth below 40 inches.

The available moisture capacity is low to moderate, and permeability is moderate. Surface runoff is very slow, and the erosion hazard is slight. Because the surface layer dries rapidly, shallow-rooted crops are subject to damage from drought. Crops also are subject to severe damage from sand blowing in spring, especially after the surface layer crusts.

This soil responds well to good management and, if adequately drained, is suitable for intensive cropping. The main crops grown are corn and soybeans. (Capability unit IIIw-4)

Alida loam (0 to 2 percent slopes) (Al).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas of soils that have a fine sandy loam or silt loam surface layer. Also included in depressions are areas of Rensselaer loam that in places is underlain by silty clay loam glacial till at a depth below 40 inches.

This soil has moderate available moisture capacity and permeability. Surface runoff is very slow, and the erosion hazard is slight. The major limitation is wetness, but it can be overcome by establishing and maintaining an adequate drainage system. This soil responds well to good management and is suitable for intensive cropping. The main crops grown are corn and soybeans. (Capability unit IIw-2)

Blount Series

The Blount series consists of deep, somewhat poorly drained, medium-textured soils. These soils are nearly level and occur on glacial till plains in the uplands. They formed in moderately fine textured glacial till under a thin mantle of loess.

Typically the surface layer is silt loam about 12 inches thick. The upper 8 inches is dark grayish brown. The lower part is grayish brown and has a few yellowish-brown mottles.

The silty clay loam subsoil, about 24 inches thick, is firm and has shiny clay films on some ped faces. A few pebbles are scattered throughout. The upper 7 inches is brown mottled with gray. The rest of the subsoil is grayish brown and gray mottled with yellowish brown.

The underlying material is brown, very firm silty clay loam that is moderately alkaline and contains a few small pebbles.

Blount soils have high available moisture capacity and good tilth, and they respond well to proper management. These soils are low in natural fertility and organic-matter content and are slowly permeable. They have a high water table at or near the surface in spring; hence, a suitable drainage system is needed if crops are to grow well.

Most areas of the Blount soils are cultivated or in bluegrass pasture, though some areas are in trees. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Blount silt loam, 0 to 2 percent slopes, 340 feet west and 200 feet south of NE. corner of SE¼ sec. 24, T. 33 N., R. 9 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, grayish-brown (10YR 5/2) silt loam that has few, fine, faint mottles of yellowish brown (10YR 5/4); weak, thin, platy structure; friable; slightly acid; clear, wavy boundary.

B21t—12 to 19 inches, brown (10YR 5/3) silty clay loam that has common, medium, distinct mottles of gray (10YR 6/1); moderate, fine, subangular blocky structure; firm; gray (10YR 5/1) clay films on ped faces; few small pebbles throughout; slightly acid; clear, wavy boundary.

B22t—19 to 26 inches, grayish-brown (10YR 5/2) heavy silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/6); structure is mod-

erate, medium, subangular blocky and moderate, medium, angular blocky; firm; dark-gray (10YR 4/1) clay films on ped faces; few small pebbles throughout; strongly acid; clear, wavy boundary.

B23t—26 to 36 inches, gray (10YR 5/1) heavy silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, prismatic structure that breaks to moderate, coarse, angular blocky; very firm; dark-gray (10YR 4/1) clay films on ped faces; few small pebbles throughout; strongly acid; clear, wavy boundary.

C—36 to 60 inches, brown (10YR 5/3) silty clay loam; massive; very firm; many small pebbles throughout; moderately alkaline (calcareous).

The solum ranges from 20 to 42 inches in thickness. The A horizons range from dark gray to brown in color and from 10 to 15 inches in thickness. The B horizons are silty clay loam to clay.

Blount soils have lighter colored A horizons than Elliott soils. Blount soils formed in moderately fine textured glacial till and lack the stratified layers of the Del Rey soils, which formed in lacustrine deposits.

Blount silt loam, 0 to 2 percent slopes (BlA).—On this soil runoff is slow, and the erosion hazard is slight. Included with this soil in mapping are small areas of gently sloping Morley silt loam on slightly elevated rises and of Pewamo silt loam in depressions. Also included are small areas of a soil that is mostly gray near the surface.

The major limitation is wetness, but it can be overcome by establishing and maintaining an adequate drainage system. This soil responds well to good management and is suitable for intensive cropping. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw-2)

Bono Series

The Bono series consists of deep, very poorly drained, fine-textured soils. These soils occur on broad depressional flats in the lake plains and are nearly level. They formed in fine-textured, glacial slack-water deposits.

Typically the surface layer is silty clay about 21 inches thick. The upper 15 inches is black, and the lower part is very dark gray.

The firm silty clay subsoil is about 18 inches thick and is gray mottled with strong brown.

The underlying material also is gray, firm silty clay, but it is mottled with yellowish brown.

Bono soils have high available moisture capacity and organic-matter content. These soils respond well to good management. The water table is at or near the surface in spring; hence, an adequate drainage system is needed to remove excess water. Internal drainage and permeability are very slow. Surface runoff is very slow or ponded.

Most areas of Bono soils are cultivated, though a few areas remain in marsh grasses. If these soils are properly managed, they are suited to all crops commonly grown in the county.

Typical profile of Bono silty clay, 200 feet west and 280 feet south of NE. corner of sec. 1, T. 35 N., R. 10 W.:

Ap—0 to 10 inches, black (10YR 2/1) light silty clay; moderate, medium, angular blocky structure; firm; many roots; medium acid; abrupt, smooth boundary.

A1—10 to 15 inches, black (N 2/0) silty clay; moderate, medium and coarse, angular blocky structure; firm; many roots along ped faces; medium acid; clear, wavy boundary.

A3—15 to 21 inches, very dark gray (N 3/0) silty clay; moderate, fine, angular blocky structure; firm; few roots; many dark reddish-brown (5YR 3/3) iron stains throughout; slightly acid; abrupt, irregular boundary.

B2g—21 to 39 inches, gray (N 5/0) silty clay that has many, medium, distinct mottles of strong brown (7.5YR 5/6); weak, medium, prismatic structure in place that breaks to moderate, medium, angular blocky when disturbed; firm when moist and sticky when wet; thick, gray (N 4/0) clay films on many ped faces; many yellowish-red (5YR 4/8) iron stains along root channels; black (N 2/0) material from the A horizon penetrates cracks and cleavages that range from 1 to 4 inches in width and extend through this horizon; neutral; abrupt, irregular boundary.

Cg—39 to 60 inches, gray (5Y 5/1) silty clay that has many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, very coarse, subangular blocky structure; firm when moist; sticky when wet; few roots; thin, gray (N 5/0) clay films on many ped surfaces; 1 percent coarse fragments that are mostly shale and dolomitic limestone; black (N 2/0) material from A horizon penetrates cracks and cleavages in upper part of horizon; thin lenses of silt and fine sand; moderately alkaline (calcareous).

The A horizons range from 15 to 24 inches in thickness. The B horizon is 40 to 60 percent clay. In some places, the B horizon contains thin layers of silty clay loam and of clay loam.

Bono soils formed in lacustrine material and are stratified. In contrast, Pewamo soils formed in moderately fine textured glacial till and show no stratification.

Bono silty clay (0 to 2 percent slopes) (Bn).—This soil is on broad, depressional flats in the old Chicago Lake plain area. Included with this soil in mapping are small areas of nearly level Milford silty clay loam.

Wetness is the major limitation. Tilth is poor. Because Bono silty clay remains wet until late in spring, field operations are delayed. This soil tends to puddle and to become hard and cloddy if it is cultivated when moisture content is high. Under good management, including an adequate drainage system, Bono silty clay is suited to all crops commonly grown in the county. The main crops are corn and soybeans. (Capability unit IIIw-2)

Borrow Pits

Borrow pits (Bp) consists of areas where loamy material, peat, and muck have been removed for use on the shoulders and slopes of roads or for land fill. The surface layer and subsoil have been removed from various kinds of soils, or have been disturbed so much that the soils cannot be identified. Borrow pits can be used as wildlife habitat. (Capability unit VIIIs-1)

Brady Series

The Brady series consists of deep, somewhat poorly drained, moderately coarse textured soils. These soils occur on outwash plains and are nearly level. They formed in moderately coarse textured outwash materials and characteristically are underlain by fine or medium sand.

Typically the surface layer is fine sandy loam about 10 inches thick. The upper 8 inches is very dark gray, and the lower part is dark grayish brown.

The subsoil is about 32 inches thick. The upper 15

inches is very friable, brown fine sandy loam that has common, yellowish-brown mottles. The lower part is light-gray loamy fine sand.

The underlying material is gray, loose fine sand that contains shale fragments.

Brady soils have low available moisture capacity and moderately rapid permeability. These soils are moderate in organic-matter content, are low in natural fertility, and are very strongly acid. Surface runoff is very slow. Because the water table is high in spring, a suitable drainage system is needed if crops are to grow well.

Most areas of Brady soils are cultivated. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Brady fine sandy loam, 480 feet east and 150 feet north of SW. corner of NW¼NE¼ sec. 30, T. 32 N., R. 8 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) fine sandy loam; moderate, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—8 to 10 inches, dark grayish-brown (10YR 4/2) fine sandy loam that has few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, granular structure that tends toward weak platy; friable; very strongly acid; clear, wavy boundary.

B2t—10 to 25 inches, brown (10YR 5/3) fine sandy loam that has common, medium, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); weak, medium, granular structure; very friable; clay bridges some sand grains; very strongly acid; clear, wavy boundary.

B3g—25 to 42 inches, light-gray (10YR 7/2), loamy fine sand; weak, medium, subangular blocky structure; very friable; small amounts of shale; very strongly acid; abrupt, wavy boundary.

IIC—42 to 60 inches, gray (10YR 5/1) fine sand that contains many fine shale fragments; single grain; loose; medium acid.

The solum ranges from 15 to 46 inches in thickness. In some areas, layers of sandy clay loam as much as 4 inches thick are in the B horizons.

The Brady soils have a coarser textured solum than the Alida soils. They have lighter colored A horizons and a finer textured solum than the Watseka soils and are more acid. Brady soils have darker colored A horizons and are coarser textured throughout than Whitaker soils, which are underlain by stratified silt and sand.

Brady fine sandy loam (0 to 2 percent slopes) (Br).—Included with this soil in mapping are small areas of Brems fine sand, 0 to 4 percent slopes, and Gilford fine sandy loam. Also included is a Brady soil that has a loamy fine sand surface layer and a Whitaker soil that has a fine sandy loam surface layer.

Brady fine sandy loam responds well to good management. It is suited to row crops and small grains if drainage is adequate. Shallow-rooted plants are subject to damage from drought. The main crops grown are corn and soybeans. (Capability unit IIIw-4)

Brems Series

The Brems series consists of deep, moderately well drained, coarse-textured soils. These soils occur on outwash plains and moraines and are nearly level to gently sloping. Brems soils formed in strongly acid to extremely acid sandy glacial drift material that has been reworked by wind. They are composed primarily of quartz sands containing small amounts of dark-colored minerals.

Typically the surface layer is very dark gray fine sand about 5 inches thick.

The subsoil is yellowish-brown, loose fine sand about 31 inches thick. The lower 15 inches has many gray and yellow mottles.

The underlying material is mottled very pale brown and light gray, loose fine sand.

Brems soils are low in organic-matter content and natural fertility. These soils have very low available moisture capacity and very rapid permeability. They are strongly acid to extremely acid, but crops respond if management is good.

Most areas of the Brems soils are wooded. Because the available moisture capacity is very low, these soils generally are not suited to row crops. Soil blowing is likely to occur if they are not protected by cover crops.

Typical profile of Brems fine sand, 0 to 4 percent slopes, 340 feet west and 140 feet south of NE. corner of SE¼SE¼ sec. 1, T. 35 N., R. 9 W.:

A1—0 to 5 inches, very dark gray (10YR 3/1) fine sand; weak, fine, granular structure; very friable; extremely acid; clear, wavy boundary.

B1—5 to 21 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; extremely acid; gradual, irregular boundary.

B2—21 to 36 inches, yellowish-brown (10YR 5/8) fine sand that has many, medium, distinct mottles of light gray (10YR 7/2) and yellow (10YR 7/6); single grain; loose; extremely acid; gradual, irregular boundary.

C1—36 to 50 inches, very pale brown (10YR 7/4) fine sand that has common, fine, distinct mottles of light gray (10YR 7/2); single grain; loose; strongly acid; clear, wavy boundary.

C2—50 to 60 inches, light-gray (10YR 6/1) fine sand that has many, medium, distinct mottles of yellow (10YR 7/6); single grain; loose; medium acid.

The A horizon ranges from 4 to 6 inches in thickness, from very dark gray to dark grayish brown in color, and from loamy fine sand to fine sand in texture. Depth to light-gray mottles ranges from 16 to 28 inches. In some places thin, discontinuous bands of different textures are below a depth of 60 inches.

The Brems soils have, in the lower part of the B horizons, mottles of low chroma that are associated with wetness, but the Oakville and Plainfield soils do not. The Brems soils are more acid than the Oakville soils. The A horizon in Brems soils is lighter colored and thinner than that in the Sparta soils.

Brems fine sand, 0 to 4 percent slopes (BsB).—This soil is subject to soil blowing if it is not protected by a plant cover. Included with this soil in mapping are small areas of nearly level and gently sloping Plainfield fine sand and Sparta fine sand. Also included are small areas of nearly level Watseka loamy fine sand. Other inclusions are some areas of a soil similar to this soil except that the surface layer is loamy fine sand.

Droughtiness is the major hazard on this soil. This soil is poorly suited to pasture, woodland, and wildlife and has severe limitations if used for corn and other row crops that require large amounts of water. (Capability unit IVs-1)

Carlisle Series

The Carlisle series consists of deep, very poorly drained, organic soils. These soils are in depressional areas that were shallow ponds or bogs. They formed in mixed organic materials derived from woody, sedgy, and grassy plant remains. In these soils the organic material extends to a depth of 42 inches or more.

Typically the upper 21 inches of organic material is black and dark reddish-brown muck.

Below a depth of 21 inches the organic material is very dark brown fibrous muck and very dark grayish-brown and dark olive-gray peat.

Carlisle soils are very high in organic-matter content. They have high available moisture capacity and moderate permeability.

Wetness is the major limitation.

If management on these soils is good and includes adequate drainage, corn crops grow well. These soils also are well suited to most special crops. Poorly drained areas are in permanent bluegrass pasture or are marshland.

Typical profile of Carlisle muck, 660 feet east and 100 feet north of SW. corner of SE¼SW¼ sec. 11, T. 34 N., R. 9 W.:

1—0 to 8 inches, black (N 2/0) muck; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

2—8 to 13 inches, dark reddish-brown (5YR 2/2) muck; moderate, medium, subangular blocky structure; friable; medium acid; abrupt, smooth boundary.

3—13 to 21 inches, dark reddish-brown (5YR 3/2) muck; weak, medium, platy structure; friable; some fibrous material; medium acid; clear, wavy boundary.

4—21 to 27 inches, very dark brown (10YR 2/2) muck; massive; friable; some fibrous material; few well-preserved seeds; medium acid; clear, wavy boundary.

5—27 to 37 inches, very dark grayish-brown (2.5Y 3/2) peat; massive; friable; medium acid; clear, wavy boundary.

6—37 to 60 inches, dark olive-gray (5Y 3/2) peat; massive; friable; few wood fragments; medium acid.

These organic soils have a varied range in depth, acidity, and degree of decomposition of the woody organic material. The well-decomposed organic material ranges from 18 to more than 40 inches in depth over the peaty material. Reaction throughout the profile ranges from neutral to strongly acid.

The Carlisle soils have thicker organic deposits than the Linwood and the Tawas soils. The muck in the Carlisle soils is more than 42 inches deep over peat, whereas the muck in both the Linwood and the Tawas soils is 12 to 42 inches deep over mineral material. Carlisle soils lack the silt loam surface layer that characterizes the Wallkill soils.

Carlisle muck (0 to 2 percent slopes) (Co).—Included with this soil in mapping are small areas of a muck that is less than 42 inches deep over clay, silt, sand, or marl. In some of these areas, the muck contains thin layers of mineral soils and the surface layer contains silty material washed from adjacent mineral soils. Also included are some marshy and wet areas that are too small to be shown separately on the map.

A high water table is the major limitation. A suitable drainage system is needed to remove excess water, but in many places an adequate outlet is difficult to establish. Soil blowing is likely when the surface layer dries and is not protected by plant cover. If adequately drained, this soil can be farmed intensively to cultivated crops. The main crops grown are corn, soybeans, onions, carrots, and potatoes. (Capability unit IIIw-8)

Clay Pits

Clay pits (Cp) consists of areas where clayey material has been removed. The surface layer and subsoil have been disturbed so much that the soils can no longer be identified. The soil material was removed to make bricks. A clay pit can be used as a wildlife habitat. (Capability unit VIIIs-1)

Darroch Series

The Darroch series consists of deep, somewhat poorly drained, medium-textured soils. These soils are nearly level and occur on lake and outwash plains. They formed in medium-textured and moderately fine textured lake and glacial outwash materials underlain by neutral, stratified fine sand and silt.

Typically the surface layer is very dark gray loam about 13 inches thick.

The subsoil is mottled and about 25 inches thick. The upper 9 inches is dark grayish-brown and grayish-brown friable loam. The lower part is light brownish-gray and gray clay loam.

The underlying material is gray and light-gray, friable sandy loam that contains stratified lenses of sand and silt and is mottled with yellowish brown.

Darroch soils are high in organic-matter content and natural fertility. Available moisture capacity is high, and permeability is moderately slow. Because these soils are nearly level, surface runoff is slow. Roots penetrate only moderately deep because of the high water table and excess water. A suitable drainage system is needed to help insure consistent crop growth.

Most areas of the Darroch soils are cultivated. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Darroch loam, 280 feet south and 100 feet west of NE. corner of SE¼ sec. 6, T. 35 N., R. 7 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 13 inches, very dark gray (10YR 3/1) loam; weak, fine, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

B11—13 to 19 inches, dark grayish-brown (10YR 4/2) loam that has few, medium, distinct mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable; few iron stains; many very dark gray (10YR 3/1) worm casts; slightly acid; clear, wavy boundary.

B12—19 to 22 inches, grayish-brown (2.5Y 5/2) loam that has few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21t—22 to 26 inches, light brownish-gray (2.5Y 6/2) clay loam that has few, fine, distinct mottles of yellowish brown (10YR 5/8) and light olive brown (2.5Y 6/4); moderate, medium, subangular blocky structure; friable; thin clay films on ped faces; strongly acid; clear, wavy boundary.

B22t—26 to 38 inches, gray (5Y 6/1) clay loam that has many, medium, prominent mottles of yellowish brown

(10YR 5/6); weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; firm; gray (10YR 5/1) clay coatings on some ped faces; light-gray (10YR 7/1) silt coatings on vertical ped faces; medium acid; clear, wavy boundary.

C1—38 to 44 inches, light-gray (10YR 7/2) sandy loam that has many, medium, prominent mottles of yellowish brown (10YR 5/6); massive; friable; mildly alkaline; clear, wavy boundary.

IIC2—44 to 60 inches, gray (10YR 6/1), stratified silt and sand that has many, medium, distinct mottles of yellowish brown (10YR 5/6); strata from 3 to 8 inches thick; massive; moderately alkaline (calcareous).

The solum ranges from 24 to 46 inches in thickness. In the A horizons the content of sand, by volume, ranges from 30 to 60 percent, and color is black to dark brown. The B horizons range from loam to gritty silty clay loam in texture and from strongly acid to slightly acid in reaction. The interbedded strata of sand and silt in the C horizons range from 1 to 12 inches in thickness and are dominantly calcareous at a depth of 42 inches or less.

The Darroch soils have darker colored A horizons than the Alida and the Whitaker soils. Darroch soils are less acid throughout the profile than Alida soils, which are underlain by shaly sand and gravel. The A horizons in Darroch soils are thicker and the B horizon and C horizon coarser textured than corresponding horizons in Del Rey series, dark colored variant.

Darroch loam (0 to 2 percent slopes) (Da).—Included with this soil in mapping are small areas where the surface layer is silt loam or fine sandy loam. Also included are small areas of nearly level Rensselaer loam and Whitaker loam.

The major limitation is excess water. Under good management that includes an adequate drainage system, this soil is suited to all crops grown in the county. The main crops are corn and soybeans. (Capability unit IIw–2)

Del Rey Series

The Del Rey series consists of deep, somewhat poorly drained, medium-textured soils. These soils are nearly level and occur on glacial lake plains. They formed in moderately fine textured lacustrine deposits.

Typically the surface layer is grayish-brown silt loam about 8 inches thick.

The subsoil is about 30 inches thick. The uppermost 9 inches is yellowish-brown silty clay loam mottled with light gray and light brownish gray. The middle is gray, firm clay loam mottled with yellowish brown. The lowermost 7 inches is gray, firm silty clay loam mottled with yellowish brown.

The underlying material is gray, firm silty clay loam that contains thin lenses of fine silt and sand and is mottled with yellowish brown.

Del Rey soils have high available moisture capacity, have good tilth, and respond well to proper management. These soils are low in natural fertility and organic-matter content. Permeability is slow. Del Rey soils have a high water table at or near the surface in spring, so an adequate drainage system is needed to remove excess water.

Most areas are cultivated. If management is good and includes an adequate drainage system, Del Rey soils are suited to all crops commonly grown in the county.

Typical profile of Del Rey silt loam, 200 feet south and 200 feet west of NE. corner of sec. 10, T. 35 N., R. 8 W.:

A1—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; light-gray (10YR 7/1) when dry; moderate, medium, granular structure; friable; very strongly acid; abrupt, smooth boundary.

B1t—8 to 10 inches, yellowish-brown (10YR 5/6) light silty clay loam that has many, medium, distinct mottles of light brownish gray (10YR 6/2) and light gray (10YR 6/1); weak, fine, subangular blocky structure; friable; grayish-brown (10YR 5/2) clay films on ped faces; very strongly acid; clear, wavy boundary.

B21t—10 to 17 inches, yellowish-brown (10YR 5/6) silty clay loam that has many, medium, distinct mottles of light gray (10YR 6/1) and light brownish gray (10YR 6/2); moderate, fine and medium, subangular blocky structure; firm; continuous, gray (10YR 6/1) clay films on all ped faces and some light-gray (10YR 7/1) silt coatings; very strongly acid; clear, wavy boundary.

B22t—17 to 31 inches, gray (10YR 6/1) heavy clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/4); weak, medium, prismatic structure that breaks to weak, coarse, subangular blocky; firm; continuous gray (5Y 5/1) clay films on vertical ped faces and discontinuous gray clay films on horizontal ped faces; medium acid; clear, wavy boundary.

B23—31 to 38 inches, gray (10YR 6/1) light silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/4); weak, coarse, platy structure; firm; few dark-gray (10YR 4/1) clay coatings on ped faces; some very dark-gray (5YR 3/1) oxide concretions; high silt content; slightly acid; clear, wavy boundary.

C—38 to 60 inches, gray (10YR 6/1) light silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/4); massive; firm; some thin lenses of fine silt and sand; many oxide concretions in upper part of horizon; moderately alkaline (calcareous).

The B horizons range from clay loam to silty clay. The solum ranges from 36 to 60 inches in thickness. Reaction in the C horizon ranges from neutral to moderately alkaline, and this horizon contains thin, stratified lenses of fine sand and silt.

Del Rey soils formed in lacustrine material and have stratified layers that are lacking in the Blount soils, which formed in glacial till. Del Rey silt loam has an A horizon that is lighter in color and not so thick as that in Del Rey silt loam, dark colored variant. The B and C horizons in Del Rey soils are finer textured than corresponding horizons in Whitaker soils.

Del Rey silt loam (0 to 2 percent slopes) (De).—Included with this soil in mapping are small areas where the surface layer is loam. Also included are small areas of nearly level Milford silty clay loam, Del Rey silt loam, dark colored variant, and Bono silty clay.

Wetness is the major limitation. Surface runoff is very slow or ponded, and internal drainage is very slow. If an adequate drainage system is provided, this soil is well suited to row crops and small grains. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw–2)

Del Rey Series, Dark Colored Variant

This variant from the Del Rey series consists of a deep, somewhat poorly drained, medium-textured soil. It is nearly level and occurs on glacial lake plains. It formed in moderately fine textured lacustrine material.

Typically the surface layer is silt loam about 13 inches thick. The upper 9 inches is very dark and the lower part is grayish brown.

The subsoil is firm silty clay loam about 35 inches thick. It is grayish brown and brown mottled with yellowish brown.

The underlying material is mottled yellowish-brown and light brownish-gray, firm silty clay loam.

Del Rey series, dark colored variant, has high available moisture capacity, has good tilth, and responds well to proper management. It is high in organic-matter content. Permeability is slow, and runoff is very slow. Roots penetrate only moderately deep because of the excess water from the high water table. A suitable drainage system is needed if crops are to grow well on this variant.

Most areas of Del Rey series, dark colored variant, have been cleared and are cultivated. If properly managed and adequately drained, this soil is well suited to all crops commonly grown in the county.

Typical profile of Del Rey silt loam, dark colored variant, 100 feet south and 40 feet east of NW. corner of SE¼ sec. 10, T. 35 N., R. 8 W.:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, fine and medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—9 to 13 inches, grayish-brown (10YR 5/2) heavy silt loam that has few, fine, faint mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B1tg—13 to 19 inches, grayish-brown (10YR 5/2) light silty clay loam that has few, fine, faint, mottles of yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; firm; dark-gray (10YR 4/1), thin clay films on ped faces; strongly acid; clear, wavy boundary.

B21tg—19 to 27 inches, brown (10YR 5/3) silty clay loam that has common, medium, distinct mottles of yellowish brown (10YR 5/8) and grayish brown (10YR 5/2); moderate, medium and coarse, subangular blocky structure; firm; gray (10YR 5/1), thin clay films on ped faces; medium acid; clear, wavy boundary.

B22tg—27 to 37 inches, grayish-brown (10YR 5/2) heavy silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate to weak, medium, prismatic structure that breaks to moderate, medium, angular blocky; firm; dark-gray (10YR 4/1) clay films on ped faces; slightly acid; clear, wavy boundary.

B3—37 to 48 inches, brown (10YR 5/3) light silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm; dark-gray (10YR 4/1), thin clay films on ped faces; neutral; clear, wavy boundary.

C—48 to 60 inches, mottled yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) light silty clay loam; massive; firm; thin lenses of fine silt and sand; mildly alkaline.

The A horizons are medium acid or strongly acid. In some places the B horizons contain thin seams of silt and sand. The solum ranges from 36 to 60 inches in thickness. The C horizon is neutral or mildly alkaline.

Del Rey silt loam, dark colored variant, formed in lacustrine material and has stratified layers that are lacking in Blount soils, which formed in glacial till. The A horizons in the Del Rey variant are darker colored and thicker than the A horizon in Del Rey silt loam. The B horizons and the C horizon in the variant are finer textured than corresponding horizons in the Darroch soils.

Del Rey silt loam, dark colored variant (0 to 2 percent slopes) (Dl).—Included with this soil in mapping are small areas of nearly level Del Rey silt loam and of Milford silt loam.

The major limitation is wetness. This soil responds well to management if it has an adequate drainage system. It is suitable for intensive cropping of corn, soybeans, and wheat. (Capability unit IIw–2)

Door Series

The Door series consists of deep, well-drained, medium-textured soils. These soils occur on outwash and glacial till plains and are nearly level or gently sloping. They formed in moderately fine textured, shaly glacial outwash. Door soils generally are underlain at a depth of 40 inches or more by sandy and gravelly outwash or by silty clay loam derived from glacial till.

Typically the surface layer is loam about 17 inches thick. The upper 12 inches is black, and the lower part is dark brown.

The subsoil is about 29 inches thick and contains shale fragments. The upper 18 inches is dark yellowish-brown and dark-brown, firm clay loam. The lower part is brown, friable sandy loam.

The underlying material is pale-olive, loose gravel and sand that contains thin lenses of mixed loamy and sandy materials.

Door soils are high in organic-matter content. They have moderate permeability and moderate or high available moisture capacity. These soils have good tilth and are suited to deep-rooted plants.

Most areas are cultivated. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Door loam, 0 to 2 percent slopes, 300 feet east and 480 feet south of NW. corner of SW¼ sec. 12, T. 35 N., R 8 W.:

Ap—0 to 8 inches, black (10YR 2/1) loam; moderate, medium, granular structure; friable; many roots; many worm casts; medium acid; abrupt, smooth boundary.

A1—8 to 12 inches, black (10YR 2/1) loam; moderate, medium, granular structure; friable; many roots; many worm casts; medium acid; clear, wavy boundary.

A3—12 to 17 inches, dark-brown (10YR 3/3) heavy loam; moderate, medium, granular structure; friable; many roots; medium acid; clear, wavy boundary.

B21t—17 to 28 inches, dark yellowish-brown (10YR 4/4) light clay loam; moderate, medium, subangular blocky structure; firm; common roots; 2 percent coarse fragments that dominantly are shale; thin, dark-brown (10YR 3/3) clay films on many ped faces; strongly acid; clear, wavy boundary.

B22t—28 to 35 inches, dark-brown (10YR 4/3) clay loam; moderate, medium, subangular blocky structure; firm; common roots; 7 percent coarse fragments that are dominantly black shale; thin, dark-brown (10YR 3/3) clay films on all ped faces; strongly acid; clear, wavy boundary.

B3—35 to 46 inches, brown (10YR 5/3) sandy loam; weak, coarse, subangular blocky structure; friable and tends to be weakly cemented; few roots; 10 percent coarse fragments; many, dark reddish-brown (5YR 3/3) iron stains; strongly acid; gradual, wavy boundary.

IIC—46 to 60 inches, pale-olive (5Y 6/3) gravel and coarse and medium sand; single grain; loose; thin lenses of mixed loamy and sandy materials; dark reddish-brown (5YR 3/3) clay films on many coarse shale fragments; medium acid.

In the A horizons, thickness ranges from 10 to 20 inches and content of sand from 30 to 60 percent. In the B horizons, thickness ranges from 25 to 40 inches and the amount of gravel from 2 to 30 percent. The C horizon contains bands of coherent loamy sand. Separated as a silty clay loam substratum phase are the Door soils that are underlain by moderately fine textured glacial till at a depth of 40 to 60 inches.

The A horizons in the Door soils are darker colored and thicker than the corresponding horizons in the Lydick and the Tracy soils. Door soils lack the A2 horizon that is characteristic of the Lydick and the Tracy soils.

Door loam, 0 to 2 percent slopes (DoA).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas where the surface layer is silt loam and contains less sand than the surface layer of this soil. Also included are some small areas of Door loam, 2 to 6 percent slopes, and of Door loam, silty clay loam substratum, 2 to 6 percent slopes.

This nearly level Door loam has no serious limitations and is better suited to crops than the gently sloping Door loam. Available moisture capacity is moderate. Surface runoff is very slow, and the erosion hazard is slight. This soil is used mostly as cropland and can be farmed intensively. The main crops grown are corn, soybeans, and wheat. (Capability unit I–1)

Door loam, 2 to 6 percent slopes (DoB).—This soil is on low knolls and ridges in the outwash plain. Included in mapping are small areas where the surface layer is silt loam and less sand is contained throughout the profile than is typical. The silt loam surface layer has a somewhat smoother feel than the loam surface layer. Also included are small areas of nearly level Door loam and of eroded gently sloping Door loam.

This gently sloping Door loam has few limitations. It has moderate available moisture capacity. Surface runoff is slow, and the erosion hazard is only slight. If management is good, this soil can be farmed intensively to cultivated crops. It is used mainly for corn, soybeans, wheat, and meadow. (Capability unit IIe–2)

Door loam, silty clay loam substratum, 2 to 6 percent slopes (DrB).—This soil occurs on low knolls and ridges in the glacial till plain. It has a profile similar to that described as typical for the series, except that this soil is underlain by fine-textured glacial till at a depth of 40 to 60 inches. Included with this soil in mapping are small areas where the surface layer is silt loam and contains less sand than the surface layer of this soil. Also included are small areas of Door loam, silty clay loam substratum, of slopes of less than 2 percent, and of slopes that are more than 6 percent.

This gently sloping Door loam has few limitations but is not so well suited to crops as the nearly level Door loam. Available moisture capacity is high because roots can utilize the available moisture in the silty clay loam substratum. Surface runoff is slow, and the erosion hazard is only slight because slopes are short. If management is good, this soil can be farmed intensively to cultivated crops. It is used mainly for corn, soybeans, wheat, and meadow. (Capability unit IIe–2)

Dune Land

Dune land (Du) is in the roughest areas in the county. It occupies a belt about three-fourths of a mile wide along the beach of Lake Michigan. This land consists of light brownish-gray and pale-brown, single-grained sand that is intermixed with a large percentage of white quartz particles and with some medium sand and fine gravel from adjoining lake beaches. Wind action has heaped the sand into irregular dunes that have peaks more than 100 feet high. The sands are either actively shifting or are so recently stabilized that no soil horizons have developed.

The hills or ridges of sand are very steep in many places along the leeward side and are more gradually sloping on the windward side. Blowouts are near the beach where wind sweeps up the sand as it blows through the long, smooth troughs between existing hills. The bare peaks are gradually fixed by the growth of grass and trees.

Dune land has very low available moisture capacity and is very droughty. It is covered with scrubby oak, some pine, and an undergrowth of vines, bushes, and grasses.

This land is used as a source of sand for fills. In the Gary industrial district, much of the Dune land has been or is being leveled for building sites. Many areas are used for recreational facilities, as at Marquette Park. (Capability unit VIIIs–1)

Elliott Series

The Elliott series consists of deep, somewhat poorly drained, medium-textured soils. These soils occur on glacial till plains of the uplands and are nearly level. Elliott soils formed in moderately fine textured, calcareous glacial till.

Typically the surface layer is very dark gray to black silt loam about 15 inches thick.

The subsoil is about 11 inches thick. The upper 4 inches is brown, firm heavy silty clay loam mottled with dark grayish brown. The lower part is dark grayish-brown silty clay mottled with yellowish brown.

The underlying material is grayish-brown and light brownish-gray glacial till that contains many small pebbles and is of silty clay loam texture.

Elliott soils are high in available moisture capacity and organic-matter content. Permeability is slow, and the water table is high in spring. These soils respond to good management that includes a tile drainage system to insure good crop growth.

Most areas of the Elliott soils are cultivated. Under good management these soils are suited to all crops commonly grown in the county.

Typical profile of Elliott silt loam, 320 feet west and 200 feet south of NW. corner of SE¼ sec. 19, T. 35 N., R. 8 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A1—8 to 15 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; many roots; medium acid; abrupt, wavy boundary.

B21t—15 to 19 inches, brown (10YR 5/3) heavy silty clay loam that has few, fine, faint mottles of dark grayish brown (10YR 4/2); moderate, fine and medium, subangular blocky structure; firm; many roots; thick, dark-gray (10YR 4/1) organic coatings and clay

films on many ped faces; neutral; clear, wavy boundary.

B22t—19 to 26 inches, dark grayish-brown (10YR 4/2) silty clay that has many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; firm; very dark gray (10YR 3/1) organic coatings and clay films on ped faces; neutral; clear, irregular boundary.

C1—26 to 32 inches, grayish-brown (2.5Y 5/2) light silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, coarse, subangular blocky structure; friable; few roots; dark-gray (N 4/0) clay films on many ped faces; very dark gray (10YR 3/1) material filling vertical pockets throughout horizon; tongues from B22 horizon; moderately alkaline (calcareous); clear, wavy boundary.

C2g—32 to 60 inches, light brownish-gray (2.5Y 6/2) silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, coarse, subangular blocky structure; friable; few roots; 3 percent coarse fragments; dark-gray (N 4/0), thick clay films on many ped faces; moderately alkaline (calcareous).

The A horizons range from 10 to 20 inches in thickness. Mottles in the upper part of the B horizons range from dark grayish brown to light brownish gray. Depth to calcareous till ranges from 20 to 42 inches.

Elliott soils have darker colored A horizons than Blount and Del Rey soils. The Elliott soils formed in moderately fine textured glacial till material and lack the strata that are typical of the Del Rey soils, which formed in lacustrine materials.

Elliot silt loam (0 to 2 percent slopes) (El).—Included with this soil in mapping are small areas of Markham silt loam that has slopes of less than 2 percent and of Pewamo silty clay loam in depressions. Also included are small areas of Markham silt loam, 2 to 6 percent slopes, eroded. Other inclusions are some areas where Elliott silt loam is eroded and other areas where it has slopes of more than 2 percent.

Runoff is slow, and the erosion hazard slight. Wetness is the major limitation. An adequate drainage system is needed to remove excess water. This soil responds well to good management and is suitable for intensive cropping. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw-2)

Gilford Series

The Gilford series consists of deep, very poorly drained, moderately coarse textured and medium-textured soils. These soils are along glacial channels and on broad depressional outwash plains. They formed in moderately coarse textured and medium-textured outwash material.

Typically the surface layer is black fine sandy loam about 22 inches thick.

The subsoil, about 16 inches thick, is dark-gray sandy loam mottled with light brownish gray and yellowish brown.

The underlying material is loose, fine and medium sand that is light brownish gray and that shades to brownish yellow and yellowish brown as depth increases.

Gilford soils are high in organic-matter content and natural fertility. Tilth is good. These soils have moderate available moisture capacity and moderately rapid permeability. Surface runoff is very slow. Because the water table is high in spring, a suitable drainage system that combines open ditches, tiles, and water table control structures is needed to insure good crop growth. This system of drainage is well suited to these soils, for it prevents the lowering of the water table and droughtiness.

Most areas of Gilford soils are cultivated. Under good management these soils are well suited to all crops commonly grown in the county. In the northern part of the county, they are used extensively for special crops.

Typical profile of Gilford fine sandy loam, 100 feet west and 100 feet north of SE. corner of SE¼ sec. 29, T. 32 N., R. 9 W.:

Ap—0 to 11 inches, black (10YR 2/1) fine sandy loam; moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

A1—11 to 22 inches, black (10YR 2/1) fine sandy loam; moderate, fine and medium, subangular blocky structure; friable; pockets of black (10YR 2/1) sandy clay loam, and lenses of light brownish-gray (10YR 6/2) medium sand; slightly acid; clear, wavy boundary.

Bg—22 to 38 inches, dark-gray (10YR 4/1) sandy loam that has common, medium, distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; friable; pockets of sandy clay loam up to 4 inches in thickness, and thin lenses of light brownish-gray (10YR 6/2) medium sand; neutral; abrupt, wavy boundary.

C1—38 to 50 inches, light brownish-gray (10YR 6/2) fine and medium sand; single grain; loose; neutral; abrupt, smooth boundary.

C2—50 to 60 inches, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/6) fine and medium sand; single grain; loose; moderately alkaline (calcareous).

The A horizons range in thickness from 12 to 24 inches and in color from black to very dark grayish brown. The pockets of sandy clay loam in the B horizon are as much as 10 inches thick in some places, and in other places the sandy clay loam occurs in thin lenses. The C horizons contain gravel in some places. Depth to moderately alkaline sand ranges from 42 to 60 inches or more.

Gilford soils have a finer textured solum than Maumee soils. The B horizon in Gilford soils is less clayey and more permeable than the B horizon in Rensselaer soils.

Gilford fine sandy loam (0 to 2 percent slopes) (Gd).—This soil is mainly along the Kankakee River in the southern part of the county. Its profile is the one described as typical for the series. Included with this soil in mapping are small areas where the surface layer is loam. Also included are small depressional areas of Maumee loamy fine sand and of Brady fine sandy loam. Other inclusions are in areas where less than 8 inches of muck is on the soil surface and in other areas where strata of fine sand and silt or till are at a depth below 40 inches.

As the surface layer of this soil dries out, it crusts, and sand grains are free to blow. Young plants may be destroyed or severely damaged by this windblown sand. The major limitation is wetness, which can be overcome by a suitable controlled drainage system. This soil responds well to good management and is suitable for intensive cropping. The main crops grown are corn and soybeans; the special crops grown are tomatoes, onions, cabbage, and carrots. (Capability unit IIw-4)

Gilford mucky fine sandy loam (0 to 2 percent slopes) (Gf).—This soil has a profile similar to that described as typical for the series, but the uppermost 8 to 12 inches of

the surface layer of this soil is higher in organic-matter content. This soil occupies the lowest depressions in the outwash plain.

Included in the mapping of this unit are small areas of Gilford loam that has a layer of muck on the surface. Also included are small areas of Tawas muck and of Maumee loamy fine sand that has a mucky plow layer.

Gilford mucky fine sandy loam retains more moisture in the surface layer than does Gilford loam. Wetness is the major limitation. A suitable drainage system is difficult to establish because outlets generally are not adequate in most places. If a suitable, controlled drainage system is established, this soil is suited to all crops commonly grown in the county. The main crops are corn, soybeans, potatoes, onions, and carrots. This mucky soil is not suited to pumpkins, squash, melons, cucumbers, strawberries, and other low-growing vine crops. (Capability unit IIw–4)

Gilford loam (0 to 2 percent slopes) (Gm).—This soil has a profile similar to that described as typical for the series, but the surface layer is loam and the subsoil is as much as 10 inches of sandy clay loam.

Included with this soil in mapping are small areas where the surface layer is fine sandy loam. Also included are small areas of Rensselaer loam. Other inclusions are areas where strata of fine sand and silt or till are at a depth below 40 inches.

The available moisture capacity is moderate, and permeability is moderately rapid. Wetness is the major limitation, but it can be overcome by a suitable controlled drainage system. This soil is used mostly as cropland and, if properly drained, can be intensively cultivated. The main crops grown are corn, soybeans, tomatoes, onions, cabbage, and carrots. (Capability unit IIw–4)

Lake Beaches

Lake beaches (Lb) are sandy deposits along the southern shores of Lake Michigan that have been washed and rewashed by waves and are covered with water during storms.

Typically this land is fine sand on the surface and becomes coarser textured with increasing depth. It is light brownish gray and pale brown, mildly alkaline, loose, and single grained. These beaches support little or no vegetation but are well suited as sites for swimming and other water sports. Many steel mills are located on these beaches. (Capability unit VIIIs–1)

Linwood Series

The Linwood series consists of deep, very poorly drained, organic soils over mineral soils. These soils are in depressional areas that were the sites of shallow ponds or bogs. Linwood soils formed in 12 to 42 inches of mixed organic materials over medium-textured and moderately fine textured mineral materials. The organic materials were derived from woody, sedgy, and grassy remains.

In a typical profile the uppermost 22 inches is black and very dark brown muck mottled with dark gray below a depth of 18 inches.

Below a depth of 22 inches is dark-gray, firm silty clay loam that contains some undecomposed wood fibers to a depth of 34 inches. Below that depth are mottles of yellowish brown.

Linwood soils are very high in organic-matter content and have very high available moisture capacity. Permeability is moderate in the muck layers and is moderately slow in the mineral soil. Because wetness is the major limitation on these soils, crops grow well only if management includes a suitable drainage system.

If management is good, Linwood soils are well suited to corn. They also are well suited to most special crops. Areas that are difficult to drain are in permanent bluegrass pasture or are marshland.

Typical profile of Linwood muck, 80 feet north and 560 feet west of SE. corner of NE¼NE¼ sec. 5, T. 34 N., R. 9 W.:

1—0 to 10 inches, black (10YR 2/1) muck; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

2—10 to 18 inches, very dark brown (10YR 2/2) muck; weak, thin, platy structure that breaks to fine granular; friable; few yellowish-red (5YR 4/6) iron stains; medium acid; clear, wavy boundary.

3—18 to 22 inches, very dark brown (10YR 2/2) sedimentary muck that has many, medium, distinct mottles of dark gray (10YR 4/1); weak, fine, subangular blocky structure; friable; few yellowish-red (5YR 4/6) iron stains; medium acid; clear, wavy boundary.

IIC1—22 to 34 inches, dark-gray (10YR 4/1) silty clay loam; massive; firm; few, black (N 2/0), undecomposed wood fibers; few yellowish-red (5YR 4/6) iron stains along root channels; small, light-gray (10YR 7/2) silt splotches; medium acid; clear, wavy boundary.

IIC2g—34 to 60 inches, dark-gray (10YR 4/1) silty clay loam that has few, medium, distinct mottles of yellowish brown (10YR 5/6); massive; firm; yellowish-red (5YR 4/6) iron stains along root channels; thin lenses of light-gray (10YR 7/1) sand; slightly acid.

Depth to the mineral soil ranges from 12 to 42 inches. The amount of undecomposed woody fibers in the muck layers varies. Reaction of the organic material ranges from strongly acid to neutral. The IIC horizons are loam to silty clay loam.

Linwood soils have a thinner organic deposit than Carlisle soils. The underlying mineral soil in Linwood soils is finer textured than that in Tawas soils. Linwood soils lack the silt loam surface layer that is present in Wallkill soils.

Linwood muck (0 to 2 percent slopes) (Lm).—Included with this soil in mapping are small areas where muck is less than 42 inches thick over clay, sand, or marl. Also included are areas where the surface layer contains silty material washed from eroded slopes. Other inclusions are in areas where the muck is deeper than 42 inches.

A high water table is the major limitation. Runoff is very slow or ponded. A suitable drainage system is needed to remove excess water, but an adequate outlet often is difficult to establish. This soil is subject to soil blowing if the surface layer becomes dry and is not protected by cover. If suitably drained, this soil can be farmed intensively to cultivated crops. The main crops grown are corn, soybeans, onions, carrots, and potatoes. (Capability unit IIIw–8)

Lydick Series

This series consists of deep, well-drained, medium-textured soils. These soils occur on outwash terraces and are nearly level and gently sloping. Lydick soils formed in moderately fine textured, shaly glacial outwash. They

are underlain by sandy and gravelly materials at a depth of more than 45 inches.

Typically the surface layer is loam about 10 inches thick. The uppermost 7 inches is very dark grayish brown, and the lower part is brown.

The subsoil is about 62 inches thick. The uppermost 31 inches is yellowish-brown and dark yellowish-brown, firm clay loam. The middle, which extends to a depth of 45 inches, is yellowish-brown sandy clay loam that has a few iron stains of yellowish red. The lower part of the subsoil is brown, firm clay loam that grades, at a depth of 55 inches, to very friable sandy loam. Below a depth of 31 inches, the subsoil contains many small shale fragments.

The underlying material is yellowish-brown, loose sand that contains a few small shale fragments.

Lydick soils are moderate in available moisture capacity, natural fertility, and organic-matter content. Permeability is moderate, and tilth is very good. These soils are very strongly acid but are well suited to crops if management is good. The physical characteristics of these soils are favorable to the deep rooting of plants.

Most areas of the Lydick soils are cultivated. Under good management these soils are well suited to all crops commonly grown in the county.

Typical profile of Lydick loam, 0 to 2 percent slopes, 940 feet south and 200 feet east of NW. corner of NE¼ sec. 26, T. 33 N., R. 8 W.:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) and dark-gray (10YR 4/1) dry loam; weak, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—7 to 10 inches, brown (10YR 4/3) loam; weak, medium, platy structure; friable; very dark grayish-brown (10YR 3/2) worm casts; very strongly acid; clear, wavy boundary.

B21t—10 to 18 inches, yellowish-brown (10YR 5/4) clay loam; weak, medium, subangular blocky structure; firm; discontinuous clay films on some ped faces; very strongly acid; gradual, wavy boundary.

B22t—18 to 31 inches, dark yellowish-brown (10YR 4/4) clay loam; weak, coarse, subangular blocky structure; firm; discontinuous clay films on some ped faces; very strongly acid; gradual, wavy boundary.

B31—31 to 45 inches, yellowish-brown (10YR 5/4) sandy clay loam; weak, coarse, subangular blocky structure; firm; 10 percent coarse material greater than 2 millimeters; few yellowish-red (5YR 4/6) iron stains; many shale fragments; very strongly acid; gradual, wavy boundary.

B32—45 to 55 inches, brown (10YR 5/3) clay loam; weak, medium, subangular blocky structure; firm; many shale fragments; medium acid; gradual, wavy boundary.

B33—55 to 62 inches, brown (10YR 5/3) sandy loam; weak, medium, subangular blocky structure; very friable; many shale fragments; medium acid; gradual, wavy boundary.

C—62 to 70 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; few small shale fragments; medium acid.

The A horizons range from 8 to 12 inches in thickness. The solum ranges from 45 to 70 inches in thickness.

The Lydick soils have thinner, lighter colored A horizons than the Door soils, which do not have an A2 horizon as is characteristic of the Lydick soils. The Ap horizon of Lydick soils is darker colored when dry than that of Tracy soils.

Lydick loam, 0 to 2 percent slopes (LyA).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas of soils that are similar to this soil except that the surface layer is fine sandy loam or silt loam. Also included are small areas of gently sloping Lydick loam and, in places, small areas of eroded Lydick loam.

This nearly level Lydick loam has no serious limitations and is better suited to crops than the gently sloping Lydick loam. Available moisture capacity and permeability are moderate. Surface runoff is very slow, and erosion is slight. This soil can be farmed intensively to cultivated crops and is used mostly as cropland. The main crops grown are corn, soybeans, and wheat. (Capability unit I–1)

Lydick loam, 2 to 6 percent slopes (LyB).—This soil has a profile similar to that of Lydick loam, 0 to 2 percent slopes. Included with this soil in mapping are areas of nearly level Lydick loam and of soils similar to this gently sloping soil except that the surface layer is fine sandy loam or silt loam. Also included are areas of eroded Lydick loam.

This Lydick loam has few limitations but is not so well suited to crops as the nearly level Lydick loam. Available moisture capacity and permeability are moderate. Surface runoff is slow. Erosion hazard is only slight because slopes are short. Under good management this soil can be farmed intensively to cultivated crops. The main crops grown are corn, soybeans, wheat, and meadow. (Capability unit IIe–2)

Markham Series

The Markham series consists of deep, moderately well drained, medium-textured soils (fig. 6). These soils occur on glacial till plains of the uplands and are gently sloping. They formed in moderately fine textured, calcareous glacial till.

Typically the surface layer is silt loam about 10 inches thick. The uppermost 7 inches is very dark grayish brown, and the lower part is dark grayish brown.

The subsoil is about 30 inches thick. The uppermost 20 inches is dark yellowish-brown and yellowish-brown, firm silty clay that grades to gritty silty clay. Grayish-brown mottling begins at a depth of 21 inches. The lower part of the subsoil is yellowish-brown, firm silty clay loam.

The underlying material is grayish-brown, firm gritty silty clay loam that contains many small pebbles throughout and is mottled with yellowish brown.

Markham soils are high in organic-matter content and available moisture capacity, but have slow permeability. The plow layer is medium acid unless it has been limed. Although these soils are subject to erosion, crops grow well on them if management is good.

Most areas of Markham soils are cultivated or are in bluegrass pasture. Under good management, these soils are suited to all crops commonly grown in the county.

Typical profile of Markham silt loam, 2 to 6 percent slopes, eroded, 360 feet west and 120 feet south of NE. corner of NW¼NE¼ sec. 17, T. 33 N., R. 8 W.:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thick, platy structure that breaks to

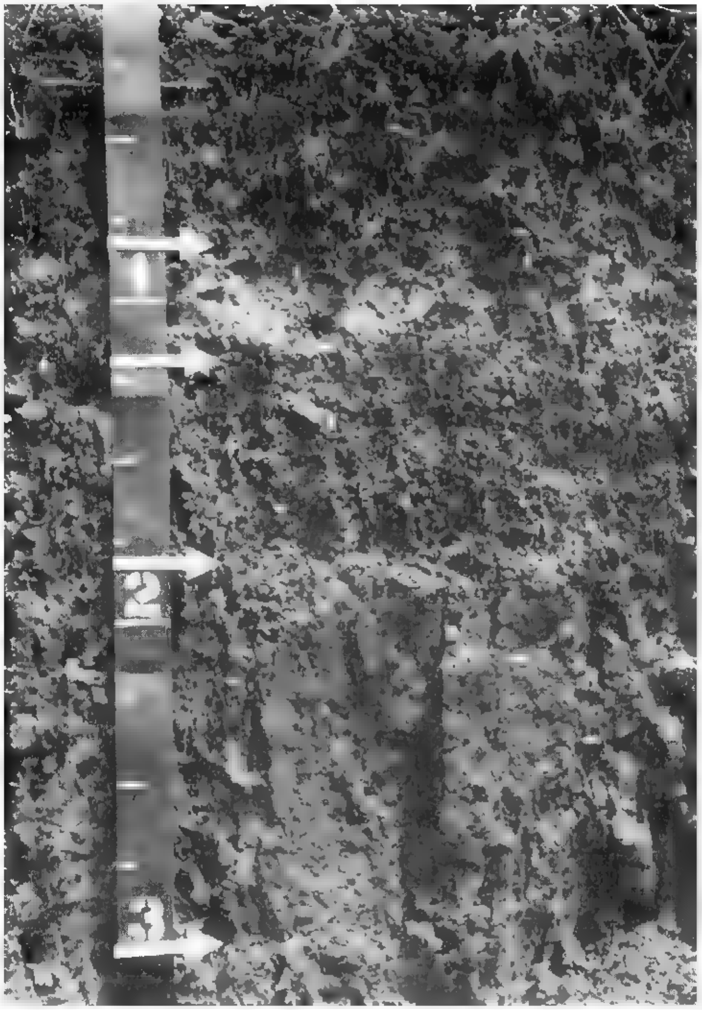

Figure 6.—**Profile of Markham silt loam, 2 to 6 percent slopes, eroded.**

moderate, fine, granular; friable; very strongly acid; clear, wavy boundary.

B21t—10 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay; strong, fine and medium, subangular blocky structure; firm; brown (10YR 5/3) clay films on ped faces; few small pebbles; strongly acid; clear, wavy boundary.

B22t—21 to 27 inches, yellowish-brown (10YR 5/6) silty clay that has few, fine, faint mottles of gray (N 5/0); moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; firm; grayish-brown (2.5Y 5/2) clay films on ped faces; few small pebbles; strongly acid; clear, wavy boundary.

B23t—27 to 30 inches, yellowish-brown (10YR 5/4) gritty silty clay that has few, fine, faint mottles of grayish brown (2.5Y 5/2); weak, coarse, subangular blocky structure; firm; grayish-brown (10YR 5/2) clay films on ped faces; common small pebbles; neutral; clear, wavy boundary.

B3—30 to 40 inches, yellowish-brown (10YR 5/6) gritty silty clay loam that has few, fine, faint mottles of grayish brown (2.5Y 5/2); weak, coarse, subangular blocky structure; firm; common small pebbles; moderately alkaline (calcareous); clear, wavy boundary.

C1—40 to 60 inches, grayish-brown (10YR 5/2) gritty silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/6); massive; firm; many small pebbles; few light-gray (10YR 7/1) calcium carbonate deposits; moderately alkaline (calcareous).

The A horizons range from 8 to 12 inches in thickness and from very dark brown to very dark grayish brown in color. Depth to gray mottling ranges from 20 to 28 inches. The solum ranges from 30 to 50 inches in thickness. The C horizon is clay loam to silty clay loam.

The Markham soils have darker colored A horizons than the Morley soils. Markham soils have thinner, lighter colored A horizons and less gray mottling in the B horizons than Elliott soils, which lack an A2 horizon.

Markham silt loam, 2 to 6 percent slopes, eroded (MaB2).—This soil occurs on low knolls and adjacent to small drainageways of the glacial till plain. Included with this soil in mapping are small areas of noneroded Markham silt loam that has slopes of less than 3 percent and other eroded areas of Markham silt loam where slopes are more than 6 percent. Also included are small areas of nearly level Elliott silt loam and of gently sloping, severely eroded Morley silty clay loam.

This Markham soil has high available moisture capacity. Runoff is medium. Erosion control practices are needed if crops are to grow well. Under good management this soil is suitable for intensive cropping. The main crops grown are corn, soybeans, and wheat. (Capability unit IIe–6)

Marl Beds

Marl beds (Mb) consists of very poorly drained, very shallow, organic soil over marl, which is a calcareous lake deposit that is 30 to 90 percent calcium carbonate. The beds are in large depressional areas, mainly in the northern part of the county, that were the sites of shallow ponds or bogs. They formed in less than 12 inches of mixed organic materials over the highly calcareous marl. The organic materials were derived from woody, sedgy, and grassy remains.

In a typical profile the surface layer is black muck about 9 inches thick. Below the muck is grayish-brown marl.

Within short distances the surface layer ranges from 2 to 12 inches in thickness. In some places the marl contains a high percentage of sandy material.

Included in this mapping unit are small areas where muck is more than 12 inches deep over marl. Also included are small depressional areas of Warners silt loam, Carlisle muck, and Tawas muck. Other inclusions are areas where the underlying material contains high percentages of sand, silt, or organic material.

Marl beds have very high available moisture capacity. Surface runoff and internal drainage are very slow. Wetness is the major limitation, and crops cannot grow well unless management is good and includes a suitable drainage system. Drainage outlets, however, are difficult to establish because marl beds are in low-lying areas.

The underlying marl is widely used as a source of lime for farming. Marl beds are well suited to most special crops, but intensive fertilization is required because some nutrients are insoluble and not available to plants. Available phosphorus and potash naturally are very low. Some of the main special crops grown are potatoes, onions, cabbage, and sweet corn. (Capability Unit VIw–1)

Marsh

Marsh (Mh) occupies shallow lakes and ponds that may be dry during years of less than normal precipitation. Most areas of Marsh, however, remain wet all year. Cattails, rushes, sedges, willows, and other water-tolerant plants grow abundantly on Marsh, and these areas are well suited to wildlife. Marshes provide refuge for wild fowl, and muskrat and mink find habitat in the larger marshes. (Capability unit VIIIw-1)

Maumee Series

The Maumee series consists of deep, very poorly drained, coarse-textured and medium-textured soils. These soils are on broad, depressional outwash plains. Maumee soils formed in coarse-textured outwash material.

Typically the surface layer is black loamy fine sand about 16 inches thick.

The subsoil, about 23 inches thick, is mottled with grayish brown and dark gray. The upper 5 inches of the subsoil is black loamy fine sand. The lower part is light-brownish gray fine sand.

The underlying material is light brownish-gray fine sand.

Maumee soils are high in organic-matter content and natural fertility and have good tilth. These soils have low available moisture capacity. Permeability is very rapid, and surface runoff is very slow. Because these soils have a high water table in spring, a suitable drainage system that combines open ditches, tiles, and water table control structures is needed if crops are to grow well. This system of drainage is well suited to these soils, for it prevents the lowering of the water table and droughtiness.

Most areas are cultivated. If management is good, these soils are well suited to all crops commonly grown in the county. In the northern part of the county, they are used extensively for special crops.

Typical profile of Maumee loamy fine sand, 80 feet east and 80 feet south of NW. corner of SW¼NE¼ sec. 30, T. 36 N., R. 9 W.:

Ap—0 to 9 inches, black (N 2/0) loamy fine sand; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary.

A1—9 to 16 inches, black (N 2/0) loamy fine sand; weak, fine, granular structure; very friable; thin, discontinuous lenses of grayish brown (2.5Y 5/2); sand; medium acid; clear, smooth boundary.

B21g—16 to 21 inches, black (N 2/0) loamy fine sand that has many coarse, distinct mottles of grayish brown (2.5Y 5/2); weak, fine, granular structure; very friable; slightly acid; gradual, wavy boundary.

B22g—21 to 39 inches, light brownish-gray (2.5Y 6/2) fine sand that has many, medium, distinct mottles of dark gray (10YR 4/1); single grain; loose; few yellowish-brown (10YR 5/6) iron stains; slightly acid; clear, wavy boundary.

Cg—39 to 60 inches, light brownish-gray (2.5Y 6/2) fine sand that has many, medium, faint mottles of pale brown (10YR 6/3); single grain; loose; few brownish-yellow (10YR 6/6) iron stains; moderately alkaline (calcareous).

The A horizons range from black to very dark gray in color, range from 12 to 20 inches in thickness, and are slightly acid to medium acid in reaction. Depth to calcareous sand ranges from 36 to 50 inches.

Maumee soils have a coarser textured solum than Gilford or Rensselaer soils. Maumee soils are more permeable than Rensselaer soils and lack the clay accumulation in the B horizon. They have thicker, darker colored A horizons and grayer B horizons than Watseka soils.

Maumee loamy fine sand (0 to 2 percent slopes) (Mm).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas where the surface layer is fine sandy loam. Also included are small areas of Gilford fine sandy loam and of Wauseon fine sandy loam. Other inclusions are areas where 3 inches of muck is on the surface.

This soil has very rapid permeability. Surface runoff is very slow. A high water table is the major limitation, but it can be overcome by a suitable controlled drainage system. If drainage is not controlled, soil blowing is likely when the surface layer becomes dry and is unprotected by cover.

Under good management this soil is suitable for intensive cropping. The main crops grown are corn, soybeans, tomatoes, onions, cabbage, and carrots. (Capability unit IIIw-1)

Maumee silt loam (0 to 2 percent slopes) (Mn).—This soil has a profile similar to that described as typical for the series except that the surface layer is silt loam about 8 to 12 inches thick and in places the subsoil has strata of silty clay loam about 1 to 4 inches thick. Included with this soil in mapping are small areas of Gilford loam and Rensselaer loam.

This soil has rapid permeability. Surface runoff is very slow. A high water table is the major hazard, but under good management that includes a suitable drainage system, this soil can be farmed intensively to cultivated crops. Most areas are used as cropland. The main crops grown are corn, soybeans, tomatoes, onions, cabbage, and carrots. (Capability unit IIIw-1)

Milford Series

The Milford series consists of deep, poorly drained, medium-textured and moderately fine textured soils. These soils are nearly level and occur in slack water or lacustrine areas. They formed in stratified, moderately fine textured and fine-textured lacustrine deposits. The underlying material is silty clay loam or sand and gravel at a depth of more than 40 inches.

Typically the surface layer is silty clay loam about 17 inches thick. It is black in the upper 9 inches and very dark gray in the lower part.

The subsoil is silty clay about 20 inches thick. The upper 6 inches is dark gray mottled with yellowish red and light brownish gray. The lower part is gray mottled with yellowish red.

The underlying material is gray silty clay loam.

Milford soils have high organic-matter content and high natural fertility. Available moisture capacity also is high, but permeability is slow. Surface runoff is very slow or ponded, and internal drainage is very slow. The water table is at or near the surface in spring, and an adequate drainage system is needed to remove excess water.

Most areas of Milford soils are cultivated. If adequately drained and properly fertilized, these soils are suited to all crops commonly grown in the county.

Typical profile of Milford silty clay loam, 900 feet

east and 30 feet north of SW. corner of NW¼ sec. 18, T. 32 N., R. 9 W.:

Ap—0 to 9 inches, black (10YR 2/1) silty clay loam; weak, medium, subangular blocky structure; firm; slightly acid; abrupt, smooth boundary.

A1—9 to 17 inches, very dark gray (N 3/0) silty clay loam that has common, fine, distinct mottles of dark brown (7.5YR 3/2); moderate, medium, prismatic structure; firm; shiny faces on peds; slightly acid; gradual, wavy boundary.

B21—17 to 23 inches, dark-gray (5Y 4/1) light silty clay that has many, medium, prominent mottles of yellowish red (5YR 4/6) and few, medium, distinct mottles of light brownish gray (2.5YR 6/2); moderate, medium, prismatic structure; firm; shiny faces on peds; very dark gray (N 3/0) fillings in cracks; neutral acid; clear, wavy boundary.

B22t—23 to 37 inches, gray (5Y 6/1) silty clay that has common, medium, prominent mottles of yellowish red (5YR 4/6); moderate, medium, prismatic structure; firm; shiny faces on peds; neutral; clear, wavy boundary.

C—37 to 60 inches, gray (5Y 5/1) silty clay loam that has common, medium, prominent mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure; firm; very dark gray (N 3/0) organic stains; neutral.

The solum ranges from 36 to 60 inches in thickness. The A horizons are 10 to 22 inches thick. The B horizons contain thin stratified layers of fine sand and gravelly sandy loam in some places. Areas underlain by calcareous sand and gravel at a depth of 40 to 60 inches are mapped separately as a sandy substratum phase.

Milford soils have less clay in the A horizons and C horizons than Bono soils, which developed in silty clay material. Milford soils developed in lacustrine material, whereas Pewamo soils developed in moderately fine textured glacial till and lack stratified layers. The A horizons and B horizons of Milford soils are finer textured than corresponding horizons in Rensselaer soils, which are underlain by interbedded silt and sand.

Milford silt loam, overwash (0 to 2 percent slopes) (Mo).—This soil has a profile similar to that described as typical for the series, except that the surface layer of this soil is silt loam instead of silty clay loam. It is underlain by silty clay loam or clay loam glacial till or lacustrine material. The silt loam extends from the surface to a depth of 8 to 20 inches.

Included with this soil in mapping are small areas where the dark-colored layer extends to a depth of 28 inches. Also included are areas of Del Rey silt loam, Pewamo silt loam, and Rensselaer loam.

Wetness is the major limitation, and an adequate drainage system is needed. This soil responds well to good management and is well suited to crops and small grains. The main crops are corn, soybeans, and wheat. (Capability unit IIw–1)

Milford silty clay loam (0 to 2 percent slopes) (Mr).—This soil has the profile described as typical for the series. It is underlain by silty clay loam lacustrine material.

Included with this soil in mapping are small areas of nearly level, slightly elevated Del Rey silt loam, of depressional Bono silty clay and Rensselaer loam, and of Marsh.

The major limitation is wetness, and an adequate drainage system is needed. Tilth is poor. If this soil is cultivated when the moisture content is too high, large clods are likely to form. These clods become hard when dry, and they are extremely difficult to break. This soil responds well to good management and is suitable for intensive cropping. The main crops are corn, soybeans, and wheat. (Capability unit IIw–1)

Milford silty clay loam, sandy substratum (0 to 2 percent slopes) (Ms).—This soil has a profile similar to that described as typical for the series, except that the underlying material in this soil is sand and gravel at a depth of 40 to 60 inches. Also, a thin layer of sandy loam to clay loam is between the silty clay loam and the sand and gravel.

Included with this soil in mapping are small areas of Rensselaer loam and Del Rey silt loam.

Wetness is the major limitation, and tilth is poor. If this soil is cultivated when the moisture content is high, large clods are likely to form. These clods become hard when dry and are extremely difficult to break. Under good management that provides a drainage system, this soil is suited to all crops commonly grown in the county. The sand and gravel underlying this soil at a depth of 40 to 60 inches favor good drainage. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw–1)

Milford-Linwood-Wallkill complex (0 to 2 percent slopes) (Mt).—This complex consists of poorly drained and very poorly drained soils that formed in organic materials and loamy and clayey mineral soils. It occurs in slack water or lacustrine areas.

The complex is about 30 percent Milford silty clay loam, about 30 percent Linwood muck, and about 30 percent Wallkill silt loam. Included in the mapping of this complex are moderately well drained soils that dominantly are of silt loam and loam textures throughout but that contain thin layers, or strata, of sandy loam. Also included are areas of soils that are calcareous throughout the profile.

Wetness is the major limitation. Surface runoff is very slow or ponded, and internal drainage is very slow. These soils have high available moisture capacity and organic-matter content. They are subject to flooding unless protected by levees.

Areas that have been cleared of trees and have adequate drainage are mostly cultivated. Other areas remain in pasture, woodland, or swamp grasses. (Capability unit IIw–1)

Morley Series

The Morley series consists of deep, moderately well drained, medium-textured and moderately fine textured soils that are gently sloping to steep (fig. 7). These soils formed in moderately fine textured glacial till under a thin mantle of loess.

Typically the surface layer is silt loam about 8 inches thick. The uppermost 6 inches is dark grayish brown, and the lower part is brown.

The subsoil extends to a depth of 44 inches and has a few small pebbles scattered throughout. The uppermost 7 inches is firm, yellowish-brown silty clay loam. The middle is very firm, yellowish-brown silty clay mottled in the lower part with grayish brown. The lower 17 inches of the subsoil, mottled with yellowish and brownish colors, is grayish-brown, very firm silty clay that grades

to firm silty clay loam. The subsoil is strongly acid to a depth of 27 inches, is slightly acid at that depth, and is moderately alkaline below a depth of 36 inches.

The underlying material is calcareous silty clay loam that contains many small pebbles and is mottled with light brownish gray and yellowish brown.

Morley soils have high available moisture capacity and are low in natural fertility and organic-matter content. Permeability is slow. These soils are subject to erosion because the subsoil and underlying material are clayey. Erosion control practices are needed to reduce soil losses.

Most areas of the Morley soils are cultivated or are in bluegrass pasture. A few areas remain wooded. Under good management, these soils are suited to all crops commonly grown in the county and crop growth is good.

Typical profile of Morley silt loam, 2 to 6 percent slopes, 200 feet east and 600 feet south of NW. corner of NW1/4 sec. 21, T. 33 N., R. 7 W.:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—6 to 8 inches, brown (10YR 5/3) silt loam; weak, coarse, platy structure that breaks to moderate, fine, subangular blocky; friable; strongly acid; abrupt, wavy boundary.

Figure 7.—**Profile of Morley silt loam, 2 to 6 percent slopes.**

B1t—8 to 12 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few small pebbles; strongly acid; clear, wavy boundary.

B21t—12 to 15 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; very dark brown (10YR 3/2) clay films on ped faces; few small pebbles; strongly acid; abrupt, wavy boundary.

B22t—15 to 23 inches, yellowish-brown (10YR 5/4) silty clay; weak, medium, prismatic structure that breaks to strong, coarse, angular blocky; very firm; very dark brown (10YR 3/2) clay films on ped faces; few small pebbles; strongly acid; clear, wavy boundary.

B23t—23 to 27 inches, yellowish-brown (10YR 5/4) silty clay that has few, fine, faint mottles of grayish brown (10YR 5/2); weak, medium, prismatic structure that breaks to strong, coarse, angular blocky; very firm; very dark brown (10YR 3/2) clay films on ped faces; few small pebbles; strongly acid; clear, wavy boundary.

B24t—27 to 36 inches, grayish-brown (10YR 5/2) silty clay that has common, fine, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure that breaks to moderate, coarse, angular blocky; very firm; very dark brown (10YR 3/2) clay films on ped faces; few small pebbles; slightly acid; clear, wavy boundary.

B3—36 to 44 inches, grayish-brown (10YR 5/2) silty clay loam that has many, medium, distinct mottles of brownish yellow (10YR 6/6); weak, medium, subangular blocky and angular blocky structure; firm; very dark grayish-brown (10YR 3/2) clay films on ped faces; few small pebbles; moderately alkaline (calcareous); clear, wavy boundary.

C—44 to 60 inches, light brownish-gray (10YR 6/2) silty clay loam that has few, medium, distinct mottles of yellowish brown (10YR 5/4); massive; firm; many small pebbles; moderately alkaline (calcareous).

The A horizons range from dark gray to brown in color and from 6 to 11 inches in thickness. The solum ranges from 20 to 48 inches in thickness.

Morley soils have lighter colored A horizons than Markham soils. The B horizons in Morley soils are browner and less mottled than the B horizons in Blount soils.

Morley silt loam, 2 to 6 percent slopes (MuB).—This soil is along drainageways and streams or on small knolls. It has the profile described as typical for the series. Included with this soil in mapping are small areas of gently sloping, eroded Morley silt loam. Also included are areas of Morley silt loam, 6 to 12 percent slopes, eroded. Other inclusions are some areas where gray mottles occur just below the surface layer. Runoff is medium.

This Morley soil has only moderate limitations, and crops grow well on it. The main crops grown are corn, soybeans, and wheat. This soil, however, normally is not farmed as a separate unit because it is so small in size. It generally is included in the farming operations of surrounding or adjacent soils. (Capability unit IIe-6)

Morley silt loam, 6 to 12 percent slopes, eroded (MuC2).—This soil is on narrow breaks that border the valleys and on ridges along small drainageways that dissect broader areas. It has a profile similar to that described as typical for the series, but some of the yellowish-brown material from the subsoil has been mixed into the dark grayish-brown plow layer and the depth to limy silty clay loam is only about 30 inches. Included with this soil in mapping are small spots where the surface layer is slightly eroded or severely eroded.

This eroded Morley soil can be used for all crops

grown in the county but has some serious limitations. It is highly susceptible to erosion because slopes are strong and surface runoff is medium to rapid. Excessive use for row crops results in an added loss of soil from the surface layer and reduces organic-matter content and natural fertility. Proper erosion control practices are needed if crop growth is to be good. The main crops grown are small grains and meadow plants. (Capability unit IIIe–6)

Morley silt loam, 12 to 18 percent slopes, eroded (MuD2).—This soil is on breaks along the major streams in the central part of the county. It has a profile similar to that described as typical for the series, but some of the yellowish brown material from the subsoil has been mixed with remnants of the original surface layer and the depth to limy silty clay loam is only about 20 inches. Included with this soil in mapping are small areas of slightly eroded Morley silt loam and of severely eroded Morley silty clay loam.

This soil is highly susceptible to erosion because slopes are moderately steep and surface runoff is rapid. Most areas are in permanent pasture or are wooded. Farming on the contour and maintaining ground cover throughout the year help in controlling erosion and runoff. (Capability unit IVe–6)

Morley silt loam, 18 to 25 percent slopes (MuE).—This soil has a profile similar to that of Morley silt loam, 2 to 6 percent slopes. It is on wooded breaks along major streams in the county. Included with this soil in mapping are small areas of Morley silt loam, 12 to 18 percent slopes, eroded.

Erosion is the major hazard because of steep slopes and rapid runoff. Permanent pasture is a suitable use for this soil (fig. 8). The response to additions of lime and fertilizer is good. (Capability unit VIe–1)

Morley silty clay loam, 2 to 6 percent slopes, severely eroded (MvB3).—This soil is on knolls and ridgetops adjacent to the level, somewhat poorly drained Blount soils and to the depressional, poorly drained Pewamo soils. It has a profile similar to that described as typical for the series except that erosion has removed most of the original surface layer. The plow layer consists largely of yellowish-brown silty clay loam from the subsoil and remnants of the original surface layer. The plow layer is lighter colored, lower in organic-matter content, and more difficult to work than the original surface layer. Runoff is medium to rapid.

Included with this soil in mapping are small areas of Morley silt loam, 6 to 12 percent slopes, eroded.

Figure 8.—**Permanent pasture in foreground. Hardwoods on breaks in background. The soil is Morley silt loam, 18 to 25 percent slopes.**

This severely eroded silty clay loam has severe limitations for use as cropland. Although it generally is farmed with less eroded Blount or Pewamo soils, this soil requires special management that helps to control erosion and to maintain good growth of crops. It is used mainly for small grains and as meadow. (Capability unit IIIe–6)

Morley silty clay loam, 6 to 12 percent slopes, severely eroded (MvC3).—This soil is along drainageways or in depressions. It has a profile similar to that described for the series except that erosion has removed most of the surface layer and, in places, some of the subsoil. The plow layer consists mostly of yellowish-brown silty clay loam from the subsoil and remnants of the grayish-brown original surface layer. The plow layer is lighter colored, lower in organic-matter content, and more difficult to plow than the original surface layer. This layer is cloddy when dry. Many small pebbles are on the surface, and often larger stones are plowed up. Gullies are common. The depth to limy silty clay loam is only about 20 inches.

Included with this soil in mapping are small areas of Morley silt loam, 6 to 12 percent slopes, eroded, and of strongly sloping Morley silty clay loam.

This soil has very severe limitations for use as cropland. It is highly susceptible to erosion and is low in fertility. Surface runoff is rapid. This soil is better suited to meadow or pasture (fig. 9) in a long rotation with row crops than to row crops grown continuously. Maintaining ground cover throughout the year is of prime importance. (Capability unit IVe–6)

Morley silty clay loam, 18 to 25 percent slopes, severely eroded (MvE3).—This gullied soil is on breaks along the streams and drainageways of the county. It has a profile similar to that described as typical for the series except that erosion has removed most of the surface layer and, in places, some of the subsoil. The plow layer consists mostly of yellowish-brown silty clay loam from the subsoil and a small amount of grayish-brown silt loam from the original surface layer.

This soil is highly susceptible to erosion because slopes are steep and runoff is very rapid. It is low in fertility and organic-matter content and is not suitable for cultivation. It is more suitable for woodland or use as wild-

Figure 9.—Excellent stand of alfalfa growing on Morley silty clay loam, 6 to 12 percent slopes, severely eroded, and on Pewamo silty clay loam in the depressions.

life habitat. Wooded areas should not be grazed, because establishing and maintaining trees on these steep slopes are of prime importance for erosion control. (Capability unit VIIe-1)

Oakville Series

The Oakville series consists of deep, excessively drained, coarse-textured soils. These soils occupy sand dunes and beach ridges and are strongly sloping to steep. They are stabilized by trees and grasses. Oakville soils formed in material derived from coarse-textured glacial drift that has been reworked by wind. They primarily are made up of quartz sand, which is not mottled within the first 40 inches of depth.

Typically the surface layer, darkened by organic matter, is black, loose fine sand about 2 inches thick.

Below the surface layer, to a depth of at least 80 inches, is light yellowish-brown, pale-brown, and light brownish-gray, loose fine sand.

Oakville soils are low in organic-matter content and natural fertility. They have very low available moisture capacity and very rapid permeability. Surface runoff is very slow, and internal drainage is very rapid.

Most areas of the Oakville soils are covered with black oaks and grasses (fig. 10). Soil blowing is a severe hazard if these soils are left uncovered. Where there are no trees or understory, these sands form active dunes.

Typical profile of Oakville fine sand, 12 to 25 percent slopes, 400 feet east and 620 feet south of NW. corner of SE¼NW¼ sec. 33, T. 37 N., R. 7 W., or 75 feet north of intersection of Forest and North Sts.:

A1—0 to 2 inches, black (10YR 2/1) fine sand; single grain; loose; neutral; clear, wavy boundary.

B—2 to 14 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; slightly acid; diffuse, wavy boundary.

C1—14 to 60 inches, pale-brown (10YR 6/3) fine sand; single grain; loose; neutral; diffuse, wavy boundary.

C2—60 to 80 inches, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) fine sand; single grain; loose; neutral.

The A horizon ranges from 1 to 4 inches in thickness and from black to brown in color. In some places the profile contains a high percentage of medium sand.

The Oakville soils are less acid throughout the profile than the Brems, Plainfield, or Tyner soils. Oakville soils lack the mottles of low chroma associated with wetness in the lower B horizon as in the Brems soils. Oakville soils have a coarser textured solum than Tyner soils.

Figure 10.—Marquette Park recreation field. An Oakville fine sand is stabilized by black oak trees and grasses

Oakville fine sand, 12 to 25 percent slopes (OaE).—Included with this soil in mapping are areas of Oakville fine sand on narrow ridges where slopes are less than 12 percent and on escarpments where slopes are more than 25 percent. Also included are areas of Plainfield fine sand and of Dune land. Other inclusions, in depressions between the ridges, are Tawas muck and mucky Maumee loamy fine sand.

Soil blowing is the major hazard because these sands become active dunes if vegetative cover is not maintained. Droughtiness also is a hazard. This soil is poorly suited to wildlife habitat but is suited to recreational uses. (Capability unit VIIIs–1)

Oakville-Tawas complex, 0 to 6 percent slopes (OkB).—This complex consists of very poorly drained and excessively drained soils that formed in organic materials and in sandy mineral soil materials. The soils in this complex have strongly contrasting properties.

This complex is about 45 percent Oakville fine sand and about 45 percent Tawas muck. The rest consists of included areas of Maumee loamy fine sand and gently sloping Oakville fine sand.

The acreage extends in the same general direction as the shores of Lake Michigan and is characterized by a pattern of long, narrow, parallel ridges and sloughs. The alternating strips are 60 to 100 feet wide. The excessively drained Oakville fine sand is on the elongated ridges, and the very poorly drained Tawas muck is in the sloughs.

The major hazards on the higher elevations are droughtiness and soil blowing because the Oakville soils are low in organic-matter content, have very low available moisture capacity, and are very rapidly permeable. The major limitation in the depressions is wetness.

In about half of the acreage of the complex, the soils are stabilized by trees and grass. The rest of the acreage is grassy swamp (fig. 11). Where adequate drainage outlets can be established, this complex is used for urban development. (Capability unit VIIIs–1)

Oshtemo Series

This series consists of deep, well-drained, moderately coarse textured soils. These soils occur on outwash terraces and are nearly level to moderately sloping. Oshtemo soils formed in moderately coarse textured, strongly acid and very strongly acid glacial outwash. They are underlain by sandy and gravelly materials at a depth below 30 inches.

Typically the surface layer is very dark grayish-brown fine sandy loam about 7 inches thick.

The subsoil, about 37 inches thick, is brown and dark yellowish-brown sandy loam that grades to loamy fine sand at a depth of 28 inches.

Figure 11.—Black oaks on ridges of an Oakville fine sand. Cattails in sloughs of Tawas muck.

The underlying material is yellowish-brown, loose fine sand mottled with light brownish gray.

Oshtemo soils have low available moisture capacity and moderately rapid permeability. They are moderate in organic-matter content and natural fertility and are strongly acid.

Most areas are cultivated. If management is good, these soils are well suited to all crops commonly grown in the county. The physical characteristics of these soils are favorable for deep-rooted plants.

Typical profile of Oshtemo fine sandy loam, 0 to 2 percent slopes, 520 feet south and 160 feet east of NW. corner of NE¼NE¼ sec. 24, T. 32 N., R. 10 W.:

- Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; gray (10YR 6/1) when dry; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.
- B21t—7 to 20 inches, brown (10YR 4/3) heavy sandy loam; weak, fine, subangular blocky structure; friable; strongly acid; clear, wavy boundary.
- B22t—20 to 28 inches, dark yellowish-brown (10YR 4/4) sandy loam; weak, medium, subangular blocky structure; friable; weak bridging of sand grains; very strongly acid; clear, wavy boundary.
- B3—28 to 44 inches, dark yellowish-brown (10YR 4/4) loamy fine sand that has common, medium, distinct mottles of light brownish gray (10YR 6/2); weak, medium, subangular blocky structure; friable; very strongly acid; clear, wavy boundary.
- C—44 to 60 inches, yellowish-brown (10YR 5/6) fine sand that has many, medium, distinct mottles of light brownish gray (10YR 6/2); single grain; loose; medium acid.

The Oshtemo soils in Lake County are more acid in the subsoil and more deeply leached than is normal for the series. The A horizon ranges from very dark grayish brown to brown. In some places the B3 horizon is sandy clay loam or clay loam less than 10 inches thick. In places, reaction in the B horizons ranges from medium to very strongly acid. The solum ranges from 30 to 50 inches in thickness. Thin, discontinuous layers of sandy loam are below a depth of 30 inches in some places.

The Oshtemo soils have a coarser textured solum than the Tracy soils and have a thinner accumulation of clay in the B2 horizon. They have a finer textured solum than Tyner soils.

Oshtemo fine sandy loam, 0 to 2 percent slopes (OsA).—This soil has the profile described as typical for the series. Included in mapping are small areas of Tracy loam, Tyner loamy fine sand, and Lydick loam that are nearly level. Also included are small areas of Oshtemo fine sandy loam and Lydick fine sandy loam that are gently sloping.

This soil is suited to crops, but it has moderate limitations. It is droughty, especially so during prolonged dry periods. Soil blowing is likely if this soil dries and is unprotected by cover. Surface runoff is very slow. This soil is used mostly as cropland, mainly for small grain, and as meadow. Also grown are corn and soybeans. (Capability unit IIIs–2)

Oshtemo fine sandy loam, 2 to 6 percent slopes (OsB).—Included with this soil in mapping are small areas of gently sloping Tracy loam, Tyner loamy fine sand, and Lydick loam. Also included are small areas of nearly level Oshtemo fine sandy loam.

This soil is suited to crops, but it has moderate limitations. Although this soil has slow runoff, it is especially droughty during prolonged dry periods and is likely to blow if dry and unprotected by cover.

This fine sandy loam is well suited to small grains and to use as meadow. Also grown are corn and soybeans, but these crops are subject to damage in droughty years. (Capability unit IIIe–13)

Oshtemo fine sandy loam, 6 to 12 percent slopes (OsC).—Included with this soil in mapping are small areas of Tracy loam and Tyner loamy fine sand that are moderately sloping. Also included are small areas of Oshtemo fine sandy loam and Lydick fine sandy loam that are gently sloping. Other inclusions are areas of Oshtemo fine sandy loam that has slopes of more than 12 percent.

Water erosion and droughtiness are the major hazards. Surface runoff is medium. Soil blowing is likely if the soil dries and is unprotected by cover. Even in years of normal rainfall, this soil does not hold enough moisture to meet the needs of a crop all summer.

This fine sandy loam is well suited to small grains and to use as meadow. Small areas are farmed with surrounding or adjacent soils. (Capability unit IIIe–13)

Pewamo Series

The Pewamo series consists of deep, poorly drained, moderately fine textured soils. These soils occur in the glacial till plains and are nearly level and depressional. They formed in moderately fine textured glacial till.

Typically the surface layer is very dark gray light silty clay loam about 15 inches thick.

The subsoil, about 27 inches thick, is firm and has a few pebbles scattered throughout. The upper 6 inches is gray silty clay loam mottled with yellowish brown. The lower part is gray clay loam mottled with yellowish brown.

The underlying glacial till material is light brownish-gray clay loam that is also mottled with yellowish brown.

Pewamo soils are high in organic-matter content. They respond well to good management. The water table is at or near the surface in spring, and an adequate drainage system is needed to remove excess water (fig. 12). The available moisture capacity is high. Permeability is slow, and surface runoff is rapid to ponded. Internal drainage is very slow.

Most areas are cultivated, though a few remain in trees. If properly managed, these soils are suited to all crops commonly grown in the county.

Typical profile of Pewamo silty clay loam, 380 feet west and 60 feet north of SE. corner of NW¼NE¼ sec. 4, T. 33 N., R. 9 W.:

- Ap—0 to 9 inches, very dark gray (10YR 3/1) light silty clay loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.
- A1—9 to 15 inches, very dark gray (10YR 3/1) light silty clay loam; strong, medium, granular structure; friable; slightly acid; clear, wavy boundary.
- B21t—15 to 21 inches, gray (N 5/0) heavy silty clay loam that has few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure that breaks to moderate, fine and medium, subangular blocky; firm; dark-gray (10YR 4/1) coatings on ped faces; few small pebbles throughout; neutral; clear, wavy boundary.
- B22t—21 to 30 inches, gray (N 6/0) heavy clay loam that has many, medium, distinct yellowish-brown (10YR

Figure 12.—**A well-established grassed waterway in cornfield on Pewamo silty clay loam carries surface runoff away from a gently sloping Markham silt loam.**

5/6) mottles; moderate, medium, prismatic structure that breaks to moderate, coarse, angular blocky; firm; gray (N 5/0) coatings on ped faces; few small pebbles throughout; neutral; clear, wavy boundary.

B23t—30 to 42 inches, light-gray (N 7/0) clay loam that has many, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, coarse, prismatic structure; firm; gray (N 6/0) coatings on ped faces; few small pebbles throughout; neutral; clear, wavy boundary.

C—42 to 60 inches, light brownish-gray (10YR 6/2) clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); massive; firm; many small pebbles throughout; moderately alkaline; calcareous.

In some low depressions, a layer of muck 3 to 12 inches thick is at the surface. The A horizons range from 10 to 20 inches in thickness, are silty clay loam, and are black or very dark gray. The B horizons are heavy clay loam, heavy silty clay loam, or light silty clay, and they range from gray to grayish brown. The solum ranges from 36 to 48 inches in thickness. The C horizon ranges from clay loam to silty clay loam.

Pewamo soils lack the thin layers, or strata, that are in Bono and Milford soils, which have developed in lacustrine material. They have a coarser textured profile throughout than Bono soils. Pewamo soils generally are more acid in the solum than is Pewamo silty clay loam, calcareous variant.

Pewamo silty clay loam (0 to 2 percent slopes) (Pc).—This soil is nearly level or depressional, and it occupies swales, narrow drainageways, and broad flats. Included with this soil in mapping are small areas of nearly level Elliott, Markham, Blount, and Morley silt loams. In some areas bordered by eroded soils, there is a silt loam mantle as much as 6 inches thick. Also included are areas of Marsh.

Wetness is the major limitation. Runoff is very slow or ponded in the more nearly level areas. Runoff is medium or rapid in the narrow drainageways where the adjacent soils are gently sloping or moderately sloping. During heavy rains, the narrow drainageways carry large amounts of water and soil erosion is a hazard. Internal drainage is very slow.

Tilth is poor. If this soil is cultivated when the moisture content is too high, large clods are likely to form. These clods harden when they dry and are extremely difficult to break. Under good management that includes a drainage system, this soil is suited to all crops commonly grown in the county. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw-1)

Pewamo Series, Calcareous Variant

This calcareous variant consists of deep, poorly drained, moderately fine textured soils. These soils occur on lake and outwash plains and are nearly level or depressional. They formed in moderately fine textured, calcareous glacial till.

Typically the surface layer is silty clay loam about 12 inches thick. It is very dark gray.

The subsoil is firm, olive-gray silty clay loam about 18 inches thick.

The underlying material is olive-gray, firm silty clay loam that has many pebbles and shale fragments.

The Pewamo variant is high in organic-matter content and natural fertility. It has high available moisture capacity and slow permeability. Surface runoff is very slow to ponded, and internal drainage is very slow. The water table is at or near the surface in spring, and an adequate drainage system is needed to remove excess water. Tilth is poor. If the soils are cultivated when the moisture content is too high, large clods are likely to form. These clods harden when they dry and are extremely difficult to break down.

Most areas of this calcareous variant are in weeds, sedges, and marsh grasses. Drained areas are suited to cultivated crops.

Typical profile of Pewamo silty clay loam, calcareous variant, 600 feet west and 900 feet north of SE. corner of sec. 17, T. 36 N., R. 9 W., east of State Route 152 and north of the Little Calumet River:

A1—0 to 12 inches, very dark gray (N 3/0) silty clay loam; moderate, fine, angular blocky structure; friable: mildly alkaline; abrupt, irregular boundary.

B1g—12 to 20 inches, olive-gray (5Y 5/2) silty clay loam that has common, medium, distinct mottles of yellowish brown (10YR 5/6) and of yellow (10YR 7/6); moderate, fine and medium, angular blocky structure; firm; tongues of very dark gray (N 3/0); moderately alkaline (calcareous); clear, wavy boundary.

B2g—20 to 30 inches, olive-gray (5Y 5/2) silty clay loam that has many, medium, prominent mottles of brownish yellow (10YR 6/6); moderate, medium and coarse, angular blocky structure; firm; moderately alkaline; calcareous; clear, wavy boundary.

C1—30 to 36 inches, olive-gray (5Y 5/2) silty clay loam that has common, medium, prominent mottles of brownish yellow (10YR 6/6); massive; firm; moderately alkaline (calcareous); clear, wavy boundary.

C2—36 to 60 inches, olive-gray (5Y 5/2) silty clay loam till; massive; firm; moderately alkaline (calcareous).

The A horizon ranges from 10 to 16 inches in thickness. In some places a 6- to 12-inch layer of loam or fine sandy loam occurs in the B horizon. The solum ranges from 25 to 40 inches in thickness. The C horizons range from silty clay loam to clay.

The Pewamo series, calcareous variant, lacks the strata that are typical of Bono and Milford soils, which formed in lacustrine materials. The calcareous variant is more alkaline in the A horizons and B horizons than other Pewamo soils.

Pewamo silty clay loam, calcareous variant (0 to 2 percent slopes) (Pe).—This soil is in depressions on the flood plain along the Little Calumet River.

Included with this soil in mapping are small areas that have a loam surface layer; areas where there is a thin layer of loam or fine sandy loam in the subsoil; and small areas of nearly level Rensselaer loam, Milford silty clay loam, Pewamo silty clay loam, and Del Rey silt loam.

Wetness is the major limitation. A suitable drainage system is difficult to establish because outlets are not adequate in most places. If drainage is adequate, this soil is suited to all crops commonly grown in the county. The main crops grown are corn, soybeans, and wheat. (Capability unit IIw–1)

Plainfield Series

The Plainfield series consists of deep, excessively drained, coarse-textured soils. These nearly level to moderately sloping soils occupy sand dunes and ridges on outwash plains and moraines. They formed in strongly acid and very strongly acid material derived from sandy glacial drift that has been reworked by wind. They primarily are made up of quartz sand that contains small amounts of dark-colored minerals and that is not mottled within the first 40 inches of depth.

Typically the surface layer is loose sand about 6 inches thick. The upper 4 inches is very dark gray, and the lower part is dark grayish brown.

Below the surface layer is yellowish-brown and light yellowish-brown, loose fine sand. To a depth of at least 70 inches is very pale brown sand.

Plainfield soils are low in organic-matter content and natural fertility. They have very low available moisture capacity and very rapid permeability. These soils respond to suitable management. Physical properties of these soils are favorable to deep-rooted plants.

Most areas of the Plainfield soils are wooded. Because available moisture capacity is very low, these soils generally are not suited to row crops. Soil blowing is likely if they are unprotected by cover.

Typical profile of Plainfield fine sand, 0 to 6 percent slopes, south of U.S. Highway No. 6, or 800 feet east and 300 feet south of NW. corner of SW¼NE¼ sec. 30, T. 36 N., R. 8 W.:

A1—0 to 4 inches, very dark-gray (10YR 3/1) fine sand; weak, fine, granular structure; very friable to loose; slightly acid; abrupt, smooth boundary.

A2—4 to 6 inches, dark grayish-brown (10YR 4/2) fine sand; weak, fine, granular structure; loose; very strongly acid; clear, wavy boundary.

B—6 to 27 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; very strongly acid; gradual, wavy boundary.

C1—27 to 33 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; very strongly acid; diffuse, wavy boundary.

C2—33 to 70 inches, very pale brown (10YR 7/4) fine sand; single grain; loose; strongly acid.

The A horizons range from 4 to 8 inches in thickness and from black to brown in color. In some places gray mottling occurs below a depth of 40 inches. Thin, discontinuous textural bands are below a depth of 60 inches in places.

Plainfield soils are more acid throughout the profile than Oakville or Sparta soils. Their A horizons are thinner and lighter colored than the A horizons of Sparta soils. Plainfield soils lack the mottles of low chroma associated with wetness in the lower B horizons that occur in Brems soils.

Plainfield fine sand, 0 to 6 percent slopes (PlB).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas of Brems fine sand and of Tyner loamy fine sand. Also included are small areas of moderately sloping Plainfield fine sand.

Droughtiness is the major hazard. This soil has severe limitations for crops, such as corn, that require large amounts of water. It also is subject to severe soil blowing, and blowouts are common if vegetative cover is not maintained. Surface runoff is very slow because most of the rainfall is absorbed by the soil. This soil is poorly suited to woodland and wildlife uses. Plantings of suitable coniferous trees are common. (Capability unit IVs-1)

Plainfield fine sand, 6 to 12 percent slopes (PlC).—This soil occupies old beach ridges and sand dunes. It has a profile similar to that of Plainfield fine sand, 0 to 6 percent slopes. Included with this soil in mapping are small areas of gently sloping Plainfield fine sand and areas where the slopes are more than 12 percent. Also included are small areas of Tyner loamy fine sand.

This soil is subject to very severe soil blowing, and blowouts are common if vegetative cover is not maintained. It is poorly suited to pasture, woodland, and development of wildlife habitat. Plantings of suitable coniferous trees are common. This soil has severe limitations to use for crops, such as corn, that require large amounts of water. (Capability unit VIs-1)

Rensselaer Series

The Rensselaer series consists of deep, poorly drained, medium-textured soils. These nearly level or depressional soils occur on lake and outwash plains. They formed in moderately fine textured lacustrine deposits or glacial outwash underlain by interbedded fine sand and silt.

Typically the surface layer, about 14 inches thick, is black. The uppermost 10 inches is loam, and the lower part is clay loam.

The subsoil is firm clay loam about 28 inches thick. The upper 13 inches is dark grayish brown, and the lower part is olive gray and gray.

The underlying material is mottled gray, grayish brown, and yellowish brown. The uppermost 6 inches is firm, gritty silty clay loam that overlies interbedded fine sand and silt.

Rensselaer soils are high in organic-matter content and natural fertility. They have high available moisture capacity and moderately slow permeability. Surface runoff is very slow or ponded, and internal drainage is very slow. Because the water table is at or near the surface in spring, an adequate drainage system is needed to remove excess water.

Most areas are cultivated. If adequately drained and otherwise well managed, these soils are suited to all crops commonly grown in the county.

Typical profile of Rensselaer loam, 500 feet west and 400 feet north of SE. corner of SW¼ sec. 4, T. 35 N., R. 8 W.:

Ap—0 to 10 inches, black (10YR 2/1) loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A1—10 to 14 inches, black (10YR 2/1) light clay loam; moderate, fine, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21tg—14 to 27 inches, dark grayish-brown (2.5Y 4/2) clay loam that has few, fine, distinct mottles of brown (10YR 5/3); moderate, coarse, prismatic structure that breaks to moderate, coarse, angular blocky; firm; very dark gray (10YR 3/1) clay films on ped faces; slightly acid; clear, wavy boundary.

B22tg—27 to 35 inches, olive-gray (5Y 5/2) clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, coarse, prismatic structure that breaks to moderate, coarse, subangular blocky; firm; gray (5Y 5/1) clay films on ped faces; mildly alkaline; clear, wavy boundary.

B23t 35 to 42 inches, gray (5Y 5/1) clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure; firm; thin, dark-gray (5Y 4/1) clay films on ped faces; mildly alkaline; clear, wavy boundary.

C1—42 to 48 inches, gray (5Y 5/1) gritty silty clay loam that has many, medium, distinct mottles of yellowish brown (10YR 5/8); massive; firm; moderately alkaline (calcareous); clear, wavy boundary.

C2—48 to 60 inches, mottled gray (5Y 5/1), yellowish-brown (10YR 5/8), and grayish-brown (10YR 5/2), interbedded fine sand and silt; single grain and massive; loose when dry and friable when moist; moderately alkaline (calcareous).

The A horizons range from 10 to 16 inches in thickness. The B21 horizon is slightly acid but grades to moderately alkaline with increasing depth. The solum ranges from 36 to 50 inches in thickness. In places strata of fine sand and silt in the C2 horizon range from 2 to 15 inches in thickness.

The Rensselaer soils have thinner A horizons than the Gilford soils and have thicker, finer textured clay accumulations in the B horizons. They are coarser textured throughout the profile than Milford soils. They have thicker, finer textured B horizons than the Rensselaer, calcareous subsoil variant, and have a coarser textured C2 horizon.

Rensselaer loam (0 to 2 percent slopes) (Re).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are small areas of Whitaker loam.

Wetness is the major limitation. This soil responds well to good management that includes an adequate drainage system. If properly managed, this soil is well suited to row crops and small grains. The main crops grown are corn and soybeans. (Capability unit IIw-1)

Rensselaer loam, sandy substratum (0 to 2 percent slopes) (Rn).—This soil is on broad, depressional flats on the outwash plain north of the Kankakee River. This sandy soil has a profile similar to that described as typical for the series except that its underlying material is coarse and fine sand mixed with fine gravel and occurs at a depth of 40 to 60 inches. The profile of this soil further differs in that the solum contains more sand than is typical and that pockets of sand are common at a depth of less than 40 inches.

Included with this soil in mapping are areas where the surface layer is silt loam and the profile, throughout, contains less sand than the profile of this soil. Also included are areas of the Gilford soils. Other inclusions are areas of a soil that is sandy loam throughout the profile.

Wetness is the major limitation. Where sand is at a depth of less than 40 inches, special precautions are needed in establishing a drainage system. The tiles must be covered with special blinding material and with filters so as to prevent the slipping of tiles and the entrance of sand into the tile lines. This soil responds well to good management that includes adequate drainage. If properly managed, this soil is well suited to row crops and small grains. The main crops grown are corn and soybeans. (Capability unit IIw-4)

Rensselaer mucky loam, sandy substratum (0 to 2 percent slopes) (Rr).—This soil occurs in the southern part of the county and occupies the lowest depressional areas of the glacial outwash plain north of the Kankakee River. It has a profile similar to that described as typical for the series except that from 8 to 12 inches of muck is on the surface and the underlying material, at a depth of from 40 to 60 inches, is fine and coarse sand mixed with fine gravel. The profile of this soil also differs in that it contains more sand than is typical.

Included with this soil in mapping are small areas of Gilford fine sandy loam that has a layer of muck on the surface.

The major limitation is wetness. A suitable drainage system is difficult to establish because outlets generally are not adequate. Runoff is very slow or ponded, and internal drainage is very slow. If a suitable drainage system is established, this soil is suited to all crops commonly grown in the county. The main crops grown are corn and soybeans. (Capability unit IIw–1)

Rensselaer Series, Calcareous Subsoil Variant

This variant consists of deep, poorly drained, medium-textured soils. These soils occur on lake and outwash plains and are nearly level or depressional. They formed in stratified, medium-textured and moderately fine textured lacustrine deposits.

Typically the surface layer is black loam about 16 inches thick. The subsoil is gray loam and silt loam about 11 inches thick. The underlying material is dark grayish-brown and dark-gray silty clay loam.

The Rensselaer variant is high in organic-matter content and natural fertility. It has high available moisture capacity and moderately slow permeability. Surface runoff is very slow or ponded, and internal drainage is very slow. Because the water table is at or near the surface in spring, an adequate drainage system is needed to remove excess water.

Most areas of this calcareous variant are cultivated. If adequately drained and otherwise well managed, these soils are suited to all crops commonly grown in the county.

Typical profile of Rensselaer loam, calcareous subsoil variant, 1,140 feet west and 940 feet north of SE. corner of NE¼ sec. 24, T. 36 N., R. 9 W.:

Ap—0 to 9 inches, black (10YR 2/1) loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—9 to 16 inches, black (10YR 2/1) loam; moderate, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B2g—16 to 23 inches, gray (10YR 5/1) loam that has common, medium, distinct mottles of olive brown (2.5Y 4/4) and few, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure; slightly firm; moderately alkaline (calcareous); clear, wavy boundary.

B3—23 to 27 inches, gray (10YR 5/1) silt loam that has many, medium, prominent mottles of yellowish brown (10YR 5/8); weak, coarse, prismatic structure; very friable; moderately alkaline (calcareous); abrupt, smooth boundary.

IIC1—27 to 36 inches, dark grayish-brown (10YR 4/2) light silty clay loam that has few, medium, distinct mottles of brownish yellow (10YR 6/6); massive; firm; light-gray (10YR 6/1) coatings of variable thickness on few ped faces and in root channels; moderately alkaline (calcareous); gradual, wavy boundary.

IIC2—36 to 60 inches, dark-gray (N 4/0) silty clay loam that has common, coarse, distinct mottles of olive brown (2.5Y 4/4); massive; very firm; moderately alkaline (calcareous).

The sand content in the A horizons ranges from 30 to 60 percent. Depth to calcareous material ranges from 15 to 30 inches. The B horizons range from fine sandy loam to clay loam. The solum ranges from 20 to 40 inches in thickness.

The Rensselaer series, calcareous subsoil variant, has thinner, coarser textured B horizons and finer textured C2 horizons than other Rensselaer soils. This variant is more acid in the A horizons than the Pewamo series, calcareous variant, and has a coarser textured solum.

Rensselaer loam, calcareous subsoil variant (0 to 2 percent slopes) (Rs).—Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are small areas of Rensselaer loam, Gilford fine sandy loam, and Wauseon fine sandy loam that are nearly level. Other inclusions are areas where thin strata of sand are present in the subsoil. Because wetness is the major limitation, a suitable drainage system must be established and maintained. This soil responds well to good management. It is well suited to row crops and small grains. The main crops grown are corn and soybeans. (Capability unit IIw–1)

Sparta Series

The Sparta series consists of deep, moderately well drained, coarse-textured soils (fig. 13). These soils occur on outwash plains and moraines and are nearly level and gently sloping. Sparta soils formed in sandy material derived from glacial drift that has been reworked by wind.

Typically the surface layer is very dark brown fine sand about 11 inches thick.

The subsoil is yellowish-brown, loose sand about 12 inches thick.

The underlying material is very pale brown, loose sand mottled with light gray.

Sparta soils are moderate in organic-matter content and natural fertility. Response to management is good. The physical properties of Sparta soils are favorable for the growing of deep-rooted plants.

Most areas are wooded or in pasture. The silty clay loam substratum phase is suited to all crops commonly grown in the county. Soil blowing is likely if these soils remain unprotected by cover.

Typical profile of Sparta fine sand, 0 to 4 percent slopes, 1,100 feet east and 840 feet north of junction of State Route 51 and Marquette Road, or 1,100 feet east and 600 feet north of SW. corner of sec. 9, T. 36 N., R. 7 W.:

Ap—0 to 11 inches, very dark brown (10YR 2/2) fine sand; very dark grayish brown (10YR 3/2) when crushed; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B—11 to 23 inches, yellowish-brown (10YR 5/4) sand; single grain; loose; slightly acid; clear, smooth boundary.

C1—23 to 55 inches, very pale brown (10YR 7/4) sand that has common, fine, faint mottles of brownish yellow (10YR 6/6) and light gray (10YR 7/2); single grain; loose; neutral; clear, smooth boundary.

C2—55 to 70 inches, very pale brown (10YR 7/3) sand that has common, medium, faint mottles of light gray

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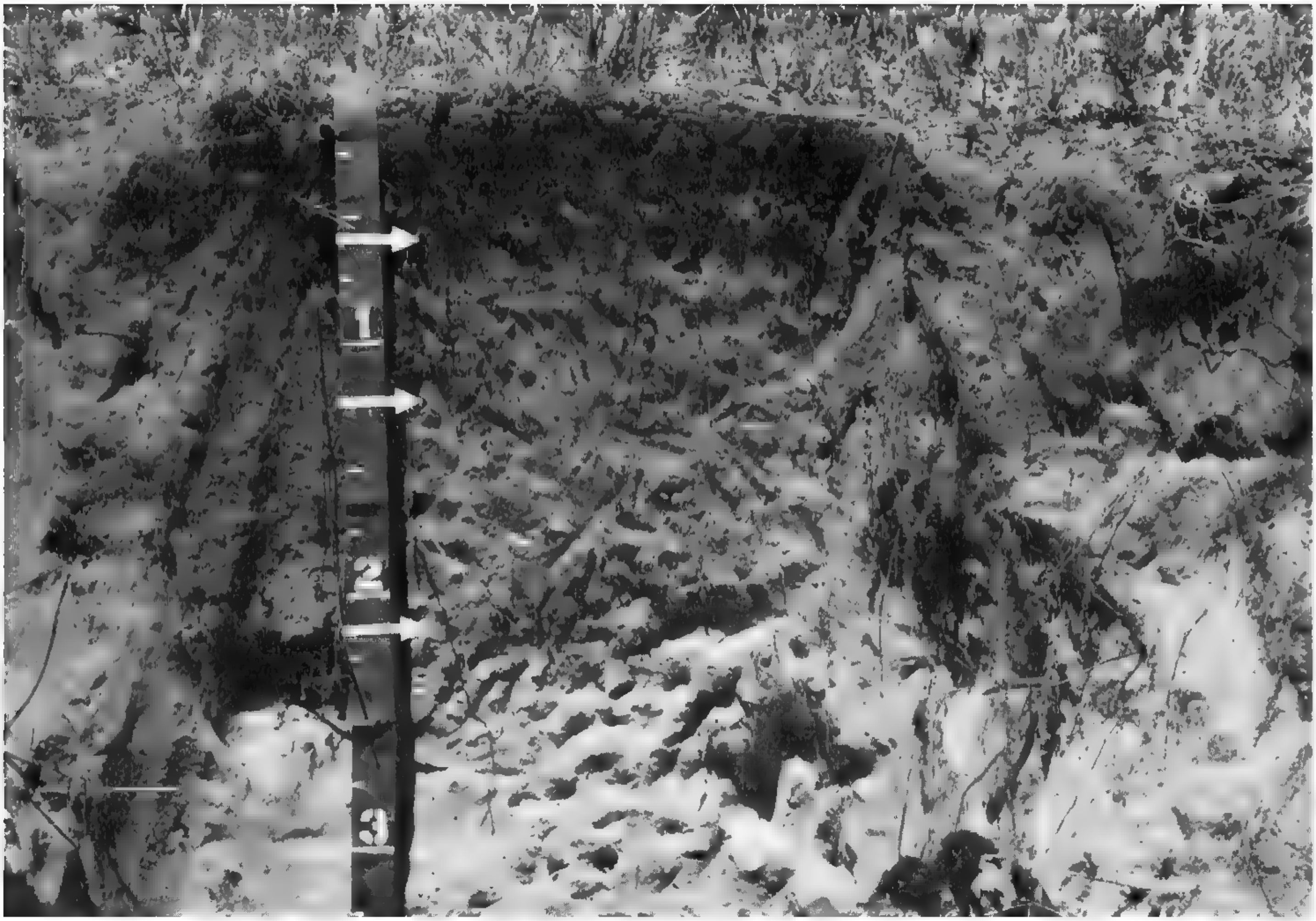

Figure 13.—Profile of Sparta fine sand, 0 to 4 percent slopes.

(2.5Y 7/2) and yellow (10YR 7/6); single grain; loose; neutral.

The A horizon ranges from 10 to 16 inches in thickness and from loamy fine sand to sand in texture. Depth to light gray mottling ranges from 20 to more than 40 inches. Reaction throughout the profile ranges from neutral to medium acid. In some places thin, discontinuous bands of soil material are below a depth of 60 inches. Where the underlying material is moderately fine textured or fine textured lacustrine material and is at a depth of 35 to 60 inches, the soil is classified as a separate silty clay loam substratum phase.

The Sparta soils have thicker A horizons than the Brems, Oakville, or Plainfield soils. Sparta soils are less acid throughout the profile than Brems or Plainfield soils. Sparta soils have the mottles of low chroma associated with wetness in the C1 horizon. These do not occur in the Oakville or Plainfield soils.

Sparta fine sand, 0 to 4 percent slopes (SpB).—This soil has the profile described as typical for the series. Included in mapping are small areas of moderately sloping Sparta fine sand. Also included are small areas of Plainfield fine sand and Brems fine sand.

Droughtiness is the major hazard. This soil has very low available moisture capacity and very rapid permeability. In years of normal rainfall, it does not hold enough moisture to supply the needs of a crop all summer. It also is subject to severe soil blowing, and if it lacks vegetative cover, blowouts are common. Surface runoff is very slow because most of the rainfall is absorbed. This fine sand is poorly suited to hardwood trees and to uses for wildlife and generally is not suited to row crops. (Capability unit IVs–1)

Sparta fine sand, silty clay loam substratum, 0 to 4 percent slopes (SrB).—This soil has a profile similar to that described as typical for the series except that at a depth of 35 to 60 inches the coarse-textured soil material is underlain by silty clay loam derived from moderately fine textured and fine-textured lacustrine materials. Included with this soil in mapping are areas where the fine sand is only 20 inches thick over the silty clay loam. Also included are small areas where the surface layer ranges from dark gray to brown in color and is fine sandy loam in texture. Other inclusions are small areas of Brems fine sand, Watseka loamy fine sand, and Wauseon fine sandy loam that are nearly level.

Surface runoff is very slow. The sandy overlying material has very low available moisture capacity and very rapid permeability. The underlying silty clay loam has high available moisture capacity and moderately slow permeability. Droughtiness is a hazard during prolonged

dry periods. Erosion is a slight hazard where the soil is gently sloping.

Most areas of Sparta fine sand, silty clay loam substratum, are cultivated. This soil is well suited to small grains and meadow crops. Also grown are corn, soybeans, and special crops. (Capability unit IIIs–2)

Tawas Series

The Tawas series consists of deep, very poorly drained, organic soil material over mineral soil material. The Tawas soils are in depressional areas that were once the sites of shallow ponds or bogs. These soils formed in 12 to 42 inches of mixed organic materials over coarse-textured mineral soils. The organic materials were derived from woody, sedgy, and grassy plant remains.

Typically the uppermost 30 inches is black muck.

At a depth of 30 to 35 inches is mottled black, dark-gray, and dark yellowish-brown friable mucky fine sand.

Below a depth of 35 inches is grayish-brown, loose fine sand mottled with yellowish red and dark yellowish brown.

Tawas soils have a high water table. These soils are very high in organic-matter content. Permeability in the organic layers is moderate and in the mineral layers is very rapid. Available moisture capacity is moderate. Wetness is the major limitation. A suitable drainage system is needed.

If adequately drained and otherwise well managed, Tawas soils are well suited to corn (fig. 14). They also are well suited to most special crops.

Typical profile of Tawas muck, 200 feet west and 100 feet south of NE. corner of NW¼ sec. 11, T. 36 N., R. 9 W.:

1—0 to 14 inches, black (10YR 2/1) muck; weak, fine, granular structure; friable; many roots and much undecomposed organic matter; slightly acid; gradual, smooth boundary.

2—14 to 30 inches, black (10YR 2/1) muck that has common, fine, distinct mottles of red (2.5YR 4/6) and few, fine, distinct mottles of dark grayish brown (2.5Y 4/2); weak, thick, platy structure; friable; many roots and much undecomposed organic matter; slightly acid; clear, wavy boundary.

IIC1—30 to 35 inches, mottled black (10YR 2/1), dark-gray (10YR 4/1), and dark yellowish-brown (10YR 4/4) mucky fine sand; weak, medium, platy structure; friable; dark-red (2.5YR 3/6), undecomposed woody material; slightly acid; clear, irregular boundary.

IIC2—35 to 60 inches, grayish-brown (2.5Y 5/2) fine sand

Figure 14.—Corn on Tawas muck, and black oaks on an isolated ridge of Tyner loamy fine sand, 0 to 6 percent slopes

that has common, medium, prominent mottles of yellowish red (5YR 4/8) and dark yellowish brown (10YR 4/4); single grain; loose; neutral.

The muck over the mineral soil ranges from 12 to 42 inches in thickness. The amount of undecomposed woody material in the muck layer varies. The transitional layer between the muck and sand ranges from 2 to 8 inches in thickness. The underlying mineral soil ranges from sand to loamy fine sand.

Tawas soils have thinner organic deposits than Carlisle soils. They have coarser textured underlying mineral soil material than Linwood soils.

Tawas muck (0 to 2 percent slopes) (Ta).—Included with this soil in mapping are small areas where muck is less than 42 inches deep over clays, silts, or marl. Also included are areas where the surface layer contains silty material washed from eroded slopes. Other inclusions are areas where the overlying muck is thicker than 42 inches and areas where the underlying material is fine sandy loam.

A high water table is the major limitation. Runoff is very slow to ponded. A suitable drainage system is needed to remove excess water. This soil adapts well to a controlled drainage system. Tawas muck is subject to soil blowing if the surface layer dries and is unprotected by vegetative cover. Areas that are difficult to drain because of poor outlets are used for permanent pasture. If adequately drained, this soil can be farmed intensively to cultivated crops. The main crops grown are corn, soybeans, onions, carrots, and potatoes. (Capability unit IIIw–8)

Tracy Series

The Tracy series consists of deep, well-drained, medium-textured soils. These soils occur on outwash and glacial till plains and are nearly level to moderately sloping. They formed in moderately fine textured shaly glacial outwash. Characteristically, the underlying material is sandy and gravelly outwash or silty clay loam derived from glacial till and is at a depth of more than 40 inches.

Typically the surface layer is dark-brown loam about 10 inches thick. It is gray when dry.

The subsoil is about 31 inches thick. The uppermost 5 inches is dark-brown loam. The middle is dark-brown and dark yellowish-brown clay loam and sandy clay loam. The remaining 6 inches is dark-brown sandy loam.

The underlying material is brown and strong-brown loamy sand and sandy loam and contains thin lenses of interbedded, yellowish-brown, loose sand.

Tracy soils are low in organic-matter content and natural fertility. These soils have moderate permeability and moderate or high available moisture capacity. They have good tilth, and physical properties are favorable to deep-rooted plants. If management is good on these strongly acid soils, crops grow well.

Most areas of Tracy soils are cultivated. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Tracy loam, 0 to 2 percent slopes, 800 feet north and 120 feet east of SW. corner of NW¼NW¼ sec. 33, T. 33 N., R. 8 W.:

Ap—0 to 8 inches, dark-brown (10YR 3/3) loam; gray (10YR 6/1) when dry; moderate, fine and medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A2—8 to 10 inches, dark-brown (10YR 4/3) loam; moderate, medium, platy structure; friable; many roots; many worm casts; thin, dark grayish-brown (10YR 4/2) coatings of organic material on many ped faces; neutral; clear, wavy boundary.

B1—10 to 15 inches, dark-brown (10YR 4/3) loam; weak, medium, subangular blocky structure; friable; common roots; many worm casts; medium acid; clear, wavy boundary.

B21t—15 to 21 inches, dark yellowish-brown (10YR 4/4) light clay loam; moderate, medium, subangular blocky structure; firm; common roots; 3 percent coarse fragments; thin, dark-brown (10YR 4/3) clay films on many ped faces; strongly acid; clear, wavy boundary.

B22t—21 to 35 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, fine and medium, subangular blocky structure; firm; common roots; 7 percent coarse fragments; thick, dark-brown (7.5YR 4/2) clay films on many ped faces; strongly acid; clear, wavy boundary.

B23—35 to 41 inches, dark-brown (7.5YR 4/4) sandy loam; weak, coarse, subangular blocky structure; firm; common roots; 10 percent coarse fragments; thin, dark-brown (7.5YR 4/2) clay films on many ped faces; few, dark reddish-brown (5YR 3/2) iron stains; strongly acid; abrupt, wavy boundary.

IIC1—41 to 46 inches, strong-brown (7.5YR 5/6) loamy sand; massive; strongly cemented; thin layers of yellowish-red (5YR 4/6) iron accumulation up to ⅛ inch in thickness occur throughout; medium acid; abrupt, wavy boundary.

IIC2—46 to 60 inches, brown (10YR 5/3) sandy loam; weak, coarse, subangular blocky structure; very friable; 10 percent coarse fragments; thin lenses of interbedded, yellowish-brown (10YR 5/4), loose medium sand; medium acid.

The sand content in the A horizons ranges from 30 to 60 percent. In some places the B horizons contain a few random cobblestones that range from 3 to 6 inches in diameter. Also in some places the B horizons have a thin layer of cemented iron particles. The solum ranges from 35 to 55 inches in thickness. The IIC horizons in places consist of strata of sand and silt and thin strata of clay. In other places the IIC horizons contain bands of coherent sandy loam. Where the underlying material is silty clay loam derived from moderately fine textured glacial till and is at a depth of 40 to 60 inches, the soil is classified as a separate substratum phase.

The Tracy soils have a finer textured, thicker solum than the Oshtemo soils. The B2 horizon in Tracy soils is firmer than that in Oshtemo soils.

Tracy loam, 0 to 2 percent slopes (TcA).—This soil has the profile described as typical for the series. Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are small areas of nearly level Tracy loam, silty clay loam substratum, and of gently sloping Tracy loam.

This soil is suited to crops and has no serious limitations. It has moderate available moisture capacity. Surface runoff is very slow, and the erosion hazard is slight. This Tracy loam can be farmed intensively to cultivated crops and is used mostly as cropland. The main crops grown are corn, soybeans, and wheat. (Capability unit I–1)

Tracy loam, 2 to 6 percent slopes (TcB).—This soil is on low knolls and ridges of the outwash plain. It has a profile similar to that of Tracy loam, 0 to 2 percent slopes. Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are

areas of nearly level Tracy loam and of eroded, gently sloping Tracy loam.

This soil is suited to crops and has few limitations. It has moderate available moisture capacity. Surface runoff is slow because slopes are short. Erosion hazard is only slight. This gently sloping loam can be farmed intensively to cultivated crops if properly managed. The main crops are corn, soybeans, wheat, and meadow. (Capability unit IIe–2)

Tracy loam, 6 to 12 percent slopes (TcC).—This soil is on breaks in the outwash plain. It has a profile similar to that of Tracy loam, 0 to 2 percent slopes. Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are small areas of gently sloping Tracy loam, of eroded Tracy loam, and of severely eroded Tracy loam that have slopes of more than 12 percent.

This moderately sloping soil has some serious limitations but can be used for all crops commonly grown in the county if management is good. It is highly susceptible to erosion. Excessive use for row crops results in additional loss of surface soil, and plowing then mixes the more clayey subsoil with the surface layer and causes poor tilth. Available moisture capacity is moderate. Proper management is needed if crops are to grow well. Mainly grown are corn, small grains, and meadow. (Capability unit IIIe–3)

Tracy loam, silty clay loam substratum, 2 to 6 percent slopes (TrB).—This soil is on low knolls and ridges of the glacial till plain. It has a profile similar to that described as typical for the series except that the underlying material is silty clay loam derived from fine-textured glacial till and is at a depth of 40 to 60 inches. Included with this soil in mapping are small areas where the surface layer is silt loam. Also included are small areas of nearly level Tracy loam, silty clay loam substratum, and of eroded, gently sloping Tracy loam, silty clay loam substratum.

This soil is suited to crops and has few limitations. It has high available moisture capacity. Plant roots can use the available moisture in the silty clay loam substratum. The erosion hazard is only slight because slopes are short. This soil can be farmed intensively to cultivated crops if properly managed. Mainly grown are corn, soybeans, wheat, and meadow. (Capability unit IIe–2)

Tyner Series

The Tyner series consists of deep, well-drained, coarse-textured soils. These soils occur on outwash plains and are nearly level to gently sloping. They formed in strongly acid to very strongly acid, sandy material derived from glacial drift that has been reworked by wind.

Typically the surface layer, about 9 inches thick, is very dark grayish-brown and dark-brown loamy fine sand that is gray when dry.

The subsoil, about 29 inches thick, is dark-brown and dark yellowish-brown loamy fine sand that is very friable. It contains a few rounded pebbles and many shale fragments.

The underlying material is dark-brown and yellowish-brown, loose medium sand. It contains many grain-sized fragments of shale.

Tyner soils are low in organic-matter content and natural fertility. They have low available moisture capacity and rapid permeability. If management is suitable on these acid soils, crops grow well. These soils have physical properties that are favorable to deep-rooted plants.

Most areas of the Tyner soils are wooded. Because available moisture capacity is very low, these soils generally are not suited to row crops. Soil blowing is likely if they are unprotected by vegetative cover.

Typical profile of Tyner loamy fine sand, 0 to 6 percent slopes, 400 feet east and 400 feet north of SW. corner of sec. 15, T. 32 N., R. 9 W.:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) and dark-brown (10YR 3/3) loamy fine sand, gray (10YR 6/1) when dry; weak, fine, granular structure; very friable; very strongly acid; abrupt, smooth boundary.

B21—9 to 22 inches, dark-brown (7.5YR 4/4) loamy fine sand; weak, fine, subangular blocky structure; very friable; few rounded pebbles and many shale fragments; strongly acid; clear, wavy boundary.

B22—22 to 38 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; weak, medium, subangular blocky structure; very friable; few rounded pebbles and many shale fragments; strongly acid; clear, wavy boundary.

C1—38 to 60 inches, yellowish-brown (10YR 5/6) medium sand; single grain; loose; many grain-sized shale fragments; strongly acid; clear, wavy boundary.

C2—60 to 70 inches, dark-brown (10YR 3/3) medium sand; single grain; loose; many grain-sized shale fragments; medium acid.

The A horizon ranges from 6 to 10 inches in thickness and from very dark grayish brown to brown in color. The B horizons range from strongly acid to very strongly acid. In some places gray mottling is below a depth of 40 inches. Thin, discontinuous bands of soil material are below a depth of 60 inches in some places.

The Tyner soils have a coarser textured solum than the Oshtemo soils and lack the clay accumulation in the B2 horizon. The solum of Tyner soils is more coherent and finer textured than that in Oakville or Plainfield soils. Tyner soils are more acid throughout the profile than Oakville soils.

Tyner loamy fine sand, 0 to 6 percent slopes (TyB).—This droughty, nearly level and gently sloping soil occurs on knolls of the outwash plain. Included with this soil in mapping are small areas where the surface layer is very dark brown to very dark gray. Also included are small areas of moderately sloping Tyner loamy fine sand. Other inclusions are small areas of Plainfield fine sand, Sparta fine sand, and Brems fine sand that are gently sloping.

Droughtiness is the major hazard. In years of normal rainfall, this soil does not hold enough moisture to meet the needs of a crop during the summer. Where knolls are exposed, this soil is subject to soil blowing. Surface runoff is very slow because most of the rainfall is absorbed. This loamy fine sand is suited to pasture, woodland, and fall-seeded small grains but is poorly suited to wildlife uses. Plantings of suitable coniferous trees are common. (Capability unit IIIs–1)

Urban Land

Urban land (Ur), mainly in the northern part of the county, is in and around communities and built-up areas. It consists of areas that have been filled with earth, cinders, basic slag, trash, or any combination of these, and that then have been smoothed over. The surface layer and subsoil have been removed or have been disturbed so much that the soil can no longer be identified. Urban land also includes those areas where sand dunes have been removed and the areas leveled. (Capability unit VIIIs-1)

Wallkill Series

The Wallkill series consists of deep, very poorly drained, mineral soil material over organic soil material. These soils are in depressional areas on till plains and lake plains. Wallkill soils formed in medium-textured mineral soil material 10 to 40 inches deep over mixed organic materials. The organic materials were derived from woody, sedgy, and grassy plant remains.

Typically the mineral soil material is silt loam about 16 inches thick. The uppermost 9 inches is very dark brown, and the lower part is very dark grayish brown.

The transitional layer between the mineral soil material and the organic soil material is black mucky silt loam about 9 inches thick.

The underlying, organic material is friable, very dark brown silty muck and black muck.

Wallkill soils are high in organic-matter content and natural fertility. These soils have very high available moisture capacity and moderate permeability. Surface runoff is very slow to ponded. Wetness is the major limitation to use. Crops grow well on these soils only if management includes an adequate drainage system.

Under good management, Wallkill soils are well suited to corn. Areas that are difficult to drain because of poor outlets are used for permanent pasture.

Typical profile of Wallkill silt loam, 500 feet east and 200 feet south of NW. corner of SE¼NE¼ sec. 17, T. 34 N., R. 9 W.:

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; very friable; slightly acid; abrupt, smooth boundary.

A11—9 to 16 inches, very dark grayish-brown (10YR 3/2) silt loam that has few, medium, faint mottles of light brownish gray (10YR 6/2); weak, coarse, prismatic structure that breaks to weak, medium, subangular blocky; friable; dark-red (2.5YR 3/6) iron stains throughout; medium acid; clear, wavy boundary.

A12—16 to 25 inches, black (10YR 2/1) mucky silt loam that has few, coarse, faint mottles of reddish gray (5YR 5/2); moderate, coarse, prismatic structure that breaks to moderate, medium and coarse, subangular blocky; friable; dark-red (2.5YR 3/6) iron stains throughout; medium acid; clear, wavy boundary.

IIlb—25 to 32 inches, very dark brown (10YR 2/2) silty muck; weak, coarse, prismatic structure; friable; yellowish-red (5YR 4/8) iron stains throughout; gray (N 5/0) coatings on ped faces; medium acid; clear, wavy boundary.

II2b—32 to 60 inches, black (5YR 2/1) muck; medium platy; friable; medium acid.

The thickness of the mineral soil material over the muck ranges from 10 to 40 inches. Reaction of both the mineral soil material and the underlying muck ranges from medium acid to neutral.

Wallkill soils consist of medium-textured, mineral soil material over muck, whereas Carlisle and Linwood soils have muck at the surface. The Wallkill soils are more acid throughout the profile than the Warners soils, which are underlain by marl.

Wallkill silt loam (0 to 2 percent slopes) (Wa).—This wet soil occurs in depressional areas on the till plains and lake plains in the county. Included with this soil in mapping are small areas where the surface layer is silty clay loam, loam, or fine sandy loam and where a thin silty clay layer is present in the mineral soil material. Also included are small depressional areas of Carlisle muck, Tawas muck, and Linwood muck.

Wetness is the major limitation. Some areas are difficult to drain because outlets are poor. Surface runoff from higher elevations is a common hazard. This soil responds well to good management that includes a suitable drainage system. If properly managed, Wallkill silt loam is well suited to row crops and small grains. The main crops grown are corn and soybeans. (Capability unit IIw-7)

Warners Series

The Warners series consists of deep, very poorly drained mineral soil material over marl. These soils are on depressional lake plains. Warners soils formed in 16 to 40 inches of medium-textured mineral soil material over highly calcareous marl.

In a typical profile the mineral soil material is silt loam about 16 inches thick. The uppermost 7 inches is black, and the lower part is very dark gray.

The mottled underlying material is gray marl about 14 inches thick.

Below the marl, at a depth of 30 inches, is mottled, light-gray marly fine sand.

Warners soils are high in organic-matter content and available moisture capacity. Surface runoff is very slow to ponded. Permeability of the marl is slow.

Wetness is the major limitation to use, and crops cannot grow well on these soils if management does not include a suitable drainage system. Because Warners soils are in low-lying areas, drainage outlets are difficult to establish.

If properly managed, Warners soils are well suited to corn. Where outlets are poor and areas are difficult to drain, these soils are used for permanent pasture.

Typical profile of Warners silt loam, 1,200 feet east and 120 feet south of NW. corner of sec. 23, T. 36 N., R. 8 W.:

Ap—0 to 7 inches, black (N 2/0) heavy silt loam; moderate, medium, granular structure; firm; moderately alkaline (calcareous); abrupt, smooth boundary.

A1—7 to 16 inches, very dark gray (N 3/0) heavy silt loam that has many, medium, distinct mottles of yellowish brown (10YR 5/4); weak, fine, angular blocky structure; very firm; moderately alkaline (calcareous); abrupt, smooth boundary.

IIC1—16 to 30 inches, gray (10YR 6/1) marl that has few, common, distinct mottles of yellowish brown (10YR 5/4); massive; very friable; many shells; mod-

erately alkaline (calcareous); abrupt, smooth boundary.

IIIC2—30 to 60 inches, light-gray (10YR 7/1) marly fine sand that has few, coarse, prominent mottles of yellowish brown (10YR 5/4); single grain; loose; moderately alkaline (calcareous).

The thickness of the mineral soil over the marl ranges from 16 to 40 inches. In some places a thin, 2- to 8-inch layer of muck is present between the mineral soil material and the marl. The marl ranges from 8 to 40 inches or more in thickness and from dark olive gray to light gray in color. The material below the marl ranges from marly fine sand to loamy fine sand. In some places lacustrine materials or silty clay loam derived from glacial till is below a depth of 40 inches.

Warners soils are more alkaline throughout the profile than Wallkill soils, which are underlain by muck.

Warners silt loam (0 to 2 percent slopes) (We).—Included with this soil in mapping are small areas where the surface layer is silty clay loam, loam, or fine sandy loam and where, in places, a silty clay layer is present in the mineral soil material. Also included are depressional areas of Wallkill silt loam, Carlisle muck, and Tawas muck.

A high water table is the major limitation. Some areas are difficult to drain because outlets are poor. A suitable drainage system is needed to remove excess water. This soil is used mostly for cropland, but intensive fertilization is required because some plant nutrients are insoluble and are not available to plants. Available phosphorus and potash naturally are very low in Warners silt loam. The main crops grown are corn, tomatoes, onions, cabbage, and carrots. (Capability unit VIw–1)

Watseka Series

The Watseka series consists of deep, somewhat poorly drained, coarse-textured soils. These soils generally are nearly level and occur on outwash plains. Watseka soils developed in medium acid to neutral, sandy material derived from glacial drift that has been reworked by wind.

Typically the surface layer is very dark brown loamy fine sand about 12 inches thick.

The subsoil extends to a depth of 26 inches; it is dark grayish brown and pale-brown, loose fine sand mottled with yellowish brown and brown. This is underlain to a depth of 60 inches by light-gray, loose fine sand mottled with yellowish brown.

Watseka soils are high in organic-matter content and moderate in natural fertility. These soils have very low available moisture capacity and rapid permeability. Reaction is medium acid to neutral throughout the profile. Crops grow well if management is good. Surface runoff is very slow. These soils have a high water table in spring. A suitable drainage system is needed to remove excess water if cultivated crops are grown.

Most areas of Watseka soils are covered by swamp grass, but with adequate drainage, these soils are well suited to most special crops.

Typical profile of Watseka loamy fine sand, 460 feet west and 60 feet south of NE. corner of SE¼ sec. 23, T. 36 N., R. 9 W.:

A1—0 to 12 inches, very dark brown (10YR 2/2) loamy fine sand; weak, fine and medium, granular structure; very friable; slightly acid; abrupt, wavy boundary.

B1—12 to 19 inches, dark grayish-brown (10YR 4/2) fine sand that has common, medium, faint mottles of yellowish brown (10YR 5/6) and brown (10YR 5/3); single grain; loose; slightly acid; clear, wavy boundary.

B2—19 to 26 inches, pale-brown (10YR 6/3) fine sand that has common, medium, distinct mottles of yellowish red (5YR 5/8) and common, medium, faint mottles of light brownish gray (10YR 6/2); single grain; loose; neutral; clear, wavy boundary.

C—26 to 60 inches, light-gray (10YR 7/2) fine sand that has few, medium, faint mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); single grain; loose; neutral; clear, wavy boundary.

The A horizon ranges from 10 to 16 inches in thickness and from black to very dark grayish brown in color. In some places, the B horizons range from dark grayish brown to yellowish brown and the C horizon from light gray to yellowish brown.

Watseka soils have a thicker, darker colored A horizon and a less acid solum than Brady soils and are coarser textured throughout the profile. They have a thinner, lighter colored A horizon and browner B horizons than Maumee soils. Watseka loamy fine sand has a more friable, coarser textured C horizon than the IIC horizon of the Watseka series, moderately deep variant.

Watseka loamy fine sand (0 to 2 percent slopes) (Wk).—Included with this soil in mapping are small areas where the surface layer is dark gray to brown fine sand or fine sandy loam. Also included are small areas of Maumee loamy fine sand, Gilford fine sandy loam, and Wauseon fine sandy loam that are nearly level.

This soil is well suited to small grains, grasses, and legumes. Shallow-rooted crops are subject to damage from drought. The main crops are tomatoes, onions, cabbage, carrots, and other special crops. (Capability unit IVw–4)

Watseka Series, Moderately Deep Variant

This variant consists of deep, somewhat poorly drained, coarse-textured soils. These soils are nearly level and occupy the outwash plains and lake plains in the county. This variant formed in about 35 inches of coarse-textured outwash material over moderately fine textured and fine-textured lacustrine materials.

Typically the surface layer is loamy sand about 15 inches thick. The uppermost 11 inches is black, and the lower part is dark grayish brown.

The subsoil, about 17 inches thick, is light olive-brown, loose fine sand.

The underlying material is mottled with gray. The uppermost 3 inches is yellowish-brown, loose fine sand. The lower part is olive-brown, firm silty clay loam that contains a few small pebbles.

This variant of the Watseka series is high in organic-matter content and moderate in natural fertility. The sandy material has very low available moisture capacity and rapid permeability. The underlying clayey material has high available moisture capacity and moderately slow permeability. Surface runoff is very slow. Because the water table is high in spring, drainage is needed to insure good growth of crops. Crops respond well if management is good.

Most areas of the Watseka series variant are cultivated. Some areas are used for special crops.

Typical profile of Watseka loamy sand, moderately deep variant, 100 feet east and 450 feet north of SW. corner of SE¼ sec. 33; T. 36 N., R. 9 W.:

A1—0 to 11 inches, black (10YR 2/1) loamy sand; weak, fine, granular structure; very friable; neutral; clear, smooth boundary.

A3—11 to 15 inches, dark grayish-brown (2.5Y 4/2) loamy sand that has few, fine, faint mottles of olive brown (2.5Y 4/4); weak, fine, granular structure; very friable; neutral; clear, wavy boundary.

B—15 to 32 inches, light olive-brown (2.5Y 5/4) fine sand that has few, fine, faint mottles of grayish brown (2.5Y 5/2); single grain; loose; neutral; clear, wavy boundary.

C1—32 to 35 inches, yellowish-brown (10YR 5/4) fine sand that has many, fine, distinct mottles of gray (10YR 6/1); single grain; loose; mildly alkaline; abrupt, smooth boundary.

IIC2—35 to 60 inches, olive-brown (2.5Y 4/4) silty clay loam that has many, fine, distinct mottles of gray (N 5/0); massive; firm; few small pebbles; mildly alkaline.

The sandy material overlying the clayey material ranges from 18 to 40 inches in thickness. The A horizons range from black to very dark grayish brown in color and from loamy sand to fine sandy loam in texture. In some places the A3 horizon is fine sand. Depth to the IIC2 horizon ranges from 18 to 40 inches, and texture is silty clay loam to clay. In some places thin layers of sandy clay loam occur above the clay layer.

Watseka series, moderately deep variant, has a browner B horizon and a coarser textured solum than Wauseon soils. It has a firmer, finer textured IIC horizon than the C horizon of other Watseka soils.

Watseka loamy sand, moderately deep variant (0 to 2 percent slopes) (Wl).—Included with this soil in mapping are small areas where the surface layer is fine sandy loam that is dark gray to grayish brown. Also included are areas of Brady fine sandy loam, Watseka loamy fine sand, and Wauseon fine sandy loam.

Wetness is the major limitation. This soil is well suited to cultivated crops if adequately drained. The main crops grown are corn, soybeans, tomatoes, onions, cabbage, and carrots. (Capability unit IIw–11)

Wauseon Series

The Wauseon series consists of deep, poorly drained, moderately coarse textured soils. These soils are nearly level and occur on outwash plains and lake plains in the county. They formed in about 34 inches of moderately coarse textured outwash material over moderately fine textured and fine textured lacustrine materials.

Typically the surface layer, about 16 inches thick, is black fine sandy loam.

Below the surface layer, to a depth of about 34 inches, is light-gray and light brownish-gray fine sandy loam and loamy fine sand that are loose and mottled with yellowish brown and brown.

The next layer, extending to a depth of 60 inches, is mottled, gray, firm silty clay loam.

Wauseon soils are high in organic-matter content and natural fertility. The sandy material has moderate available moisture capacity and moderately rapid permeability. The underlying clayey material has high available moisture capacity and moderately slow permeability. Surface runoff is very slow. Because the water table is high in spring, management that includes an adequate drainage system is needed to insure good crop growth. These soils respond well to good management.

Most areas of the Wauseon soils are cultivated. These soils are well suited to all crops commonly grown in the county. Some areas are used for special crops.

Typical profile of Wauseon fine sandy loam, 1,840 feet north and 120 feet east of SW. corner of SE¼ sec. 27, T. 36 N., R. 9 W.:

Ap—0 to 9 inches, black (10YR 2/1) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

AB—9 to 16 inches, black (10YR 2/1) fine sandy loam; weak, fine, granular structure; very friable; numerous thin lenses of light-gray (10YR 7/1) fine sand ⅛ to ¼ inch thick give a variegated appearance to the horizon; neutral; gradual, wavy boundary.

Bg—16 to 22 inches, light-gray (10YR 7/1) fine sandy loam that has few, medium, distinct mottles of yellowish brown (10YR 5/6); single grain; loose; thin streaks of very dark gray (10YR 3/1) material penetrate from above; few, thin, flat fragments; neutral; clear, wavy boundary.

C1—22 to 34 inches, light brownish-gray (10YR 6/2) loamy fine sand that has common, medium, faint mottles of brown (10YR 5/3); single grain; loose; few, thin, flat and rounded fragments; neutral; abrupt, smooth boundary.

IIC2—34 to 60 inches, gray (5Y 5/1) heavy silty clay loam that has common, medium, faint mottles of brown (10YR 5/3); massive; firm; mildly alkaline.

The A horizons range from 12 to 24 inches in thickness. The sandy material overlying the clayey material ranges from 25 to 40 inches in thickness. Depth to the IIC2 horizon ranges from 25 to 40 inches, and texture is silty clay loam to clay. In some places above the clay layer, thin, discontinuous strata of silt and clay occur with pockets of fine gravel.

Wauseon soils have a grayer B horizon and a finer textured solum than the Watseka variant. They have a thinner Bg horizon and a finer textured IIC2 horizon than Gilford soils.

Wauseon fine sandy loam (0 to 2 percent slopes) (Wo).—Included with this soil in mapping are small areas where the surface layer is loam or loamy fine sand that is dark gray to grayish brown. Also included are areas of Maumee loamy fine sand, Gilford fine sandy loam, and Watseka loamy fine sand.

Wetness is the major limitation. Because of the high water table, this soil is not suited to deep-rooted plants. If adequately drained, it is well suited to cultivated crops. Corn, soybeans, tomatoes, onions, cabbage, and carrots are the main crops. (Capability unit IIw–4)

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, medium-textured soils. These soils are nearly level and occur on lake plains and outwash plains in the county. They formed in moderately fine textured glacial outwash underlain by calcareous strata of silt and sand.

Typically the surface layer is loam about 10 inches thick. The uppermost 7 inches is dark gray, and the lower part is pale brown.

The clay loam subsoil is about 25 inches thick. The uppermost 3 inches is pale brown mottled with brownish yellow. The middle is pale brown and light brownish gray and is mottled with grayish and brownish colors. The lowest 4 inches is light brownish gray; contains thin strata of fine sand, of silt, and of clay; and is mottled with strong brown and pale brown.

The underlying material, extending to a depth of 60 inches, is mottled with brownish and yellowish colors. The uppermost 13 inches is light brownish-gray sandy clay loam that contains thin layers of sandy loam. The lower part is brownish-yellow, stratified silt and fine sand.

Whitaker soils are low in natural fertility. Available moisture capacity is high, and permeability is moderately slow. Because these soils are nearly level, there is little runoff. Roots penetrate only moderately deep because of the high water table and excess water. A suitable drainage system is needed if crops are to grow well.

Most areas of the Whitaker soils have been cleared, are artificially drained, and are in cultivated crops. If properly managed, these soils are well suited to all crops commonly grown in the county.

Typical profile of Whitaker loam, 740 feet south and 200 feet east of NW. corner of SW¼ sec. 29 T. 36 N., R. 7 W.:

Ap—0 to 7 inches, dark-gray (10YR 4/1) loam; moderate, fine, granular structure; friable; some splotches of yellowish brown (10YR 6/3); slightly acid; abrupt smooth boundary.

A2—7 to 10 inches, pale-brown (10YR 6/3) light loam that has common, medium, faint mottles of light gray (2.5Y 7/2) and few, fine, distinct mottles of brownish yellow (10YR 6/6); weak, thick, platy structure; friable; few, fine, dark-colored, soft concretions; few dark-gray (10YR 4/1) channel fillings; slightly acid; clear, wavy boundary.

B1—10 to 13 inches, pale-brown (10YR 6/3) light clay loam that has many, medium, distinct mottles of brownish yellow (10YR 6/6); weak, medium, subangular blocky structure; friable; few dark-gray (10YR 4/1) channel fillings; light brownish-gray (2.5Y 6/2), continuous clay films on ped faces; few, small, dark-colored soft concretions; slightly acid; clear, wavy boundary.

B21t—13 to 24 inches, pale-brown (10YR 6/3) medium clay loam that has many, fine, faint mottles of light brownish gray (10YR 6/2) and common, fine, distinct mottles of reddish yellow (7.5YR 6/8); weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; firm; few small pebbles; few, small, dark-colored, soft concretions; light-gray (2.5Y 7/2), continuous clay films on vertical ped faces; slightly acid; clear, wavy boundary.

B22t—24 to 31 inches, light brownish-gray (10YR 6/2) clay loam that has many, fine, faint mottles of pale brown (10YR 6/3) and strong brown (7.5YR 5/6); moderate, coarse, subangular blocky structure; firm; grayish-brown (2.5Y 5/2), discontinuous clay films on vertical and horizontal ped faces; pockets of brown (10YR 4/3) sandy loam in uppermost 2 inches; few, small, dark-colored, soft concretions; slightly acid; clear, wavy boundary.

B3—31 to 35 inches, light brownish-gray (10YR 6/2) clay loam that has many, coarse, distinct mottles of strong brown (7.5YR 5/6) and many, medium, distinct mottles of pale brown (10YR 6/3); thin strata of fine sand, of silt, and of clay; weak, medium, platy structure; firm; few, small, dark-colored, soft concretions; neutral; clear, wavy boundary.

C1—35 to 48 inches, light brownish-gray (2.5Y 6/2) sandy clay loam that has many, coarse, distinct mottles of yellowish brown (10YR 5/6) and many, medium, distinct mottles of dark yellowish brown (10YR 4/4); discontinuous lenses of sandy loam; massive; firm; neutral; clear, wavy boundary.

C2—48 to 60 inches, brownish-yellow (10YR 6/6), stratified silt and fine sand that has many, medium, distinct mottles of light brownish gray (2.5Y 6/2); massive and single grain; friable; moderately alkaline (calcareous).

410-618—72——4

The solum ranges from 30 to 50 inches in thickness. The content of sand in the A horizons ranges from 30 to 60 percent. Light brownish-gray mottles are in the uppermost 10 inches of the B horizons. Depth to calcareous underlying material ranges from 42 to 60 inches. In the C horizons considerable variation in texture occurs. In some places these horizons are dominantly silt, but in other places they are mainly fine sand.

Whitaker soils have lighter colored A horizons than Darroch soils, which lack an A2 horizon. They have coarser textured B and C horizons than corresponding horizons in Del Rey soils. Whitaker soils have lighter colored A horizons than the Del Rey series, dark colored variant.

Whitaker loam (0 to 2 percent slopes) (Wt).—Included with this soil in mapping are small areas of soils that have a surface layer of silt loam, contain less sand than is typical, and occur in a somewhat smoother part of the landscape. Also included are small areas of Rensselaer loam and of Darroch loam that are nearly level.

The major limitation is excess water. An adequate drainage system is needed. Response is good if this soil is properly drained and limed. Under proper management it is suited to most crops grown in the county. The main crops are corn, soybeans, and wheat. (Capability unit IIw-2)

Use and Management of the Soils

This section gives information on the use and management of the soils in Lake County for cultivated crops and pasture, engineering structures and practices, town and country planning, trees, wildlife and fish, and recreation.

Specific management for individual soils is not suggested in this section. Detailed information on use and management can be provided by the local conservationist of the Soil Conservation Service or by the Lake County Cooperative Extension Service.

Cultivated Crops and Pasture

About 80 percent of Lake County is used for crops and pasture. The main crops are corn, soybeans, small grains, and meadow. A small acreage is used for special crops, which are discussed under the heading "Special Crops."

Some of the major management concerns in this county are wetness, soil blowing and water erosion, maintenance of fertility and organic-matter content, and maintenance of good tilth or improvement of tilth. Of the intensively cultivated acreage, about 40 percent is limited by wetness and 15 percent by erosion hazard. Only 5 percent of the acreage has few limitations for crops.

The major management practices are installing suitable tile drainage systems, grassing waterways, contour farming, diversion terracing, grade stabilizing, minimum tillage; use of crop residues, green manure crops, and winter cover crops; and for most of these soils, applying lime and fertilizer in amounts indicated by tests and field trials.

On the pages that follow, the system of capability grouping used by the Soil Conservation Service is dis-

cussed; the soils in each capability unit are described; and management suited to the soils in each unit is suggested. Estimated acre yields of the principal crops are given for all the soils in the county in table 2.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soil are grouped at three levels, the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use and are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. No Class V soils in Lake County.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture or range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers generally are assigned locally but are part of a statewide system. All of the units in the system are not represented by the soils of Lake County; therefore, the capability unit numbers in this soil survey are not consecutive.

In the following pages the capability units in Lake County are described and suggestions for the use and management of the soils are given. The names of the soil series represented in a capability unit are given, but this does not mean that all soils of the series named are in that particular unit. To find the capability unit assigned any specific soil, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

This unit consists of deep, well-drained, nearly level soils on outwash terraces. These are soils of the Door, Lydick, and Tracy series. They have a medium-textured surface layer and a moderately fine textured subsoil. Permeability and available moisture capacity are moderate. Surface runoff is very slow, and the erosion hazard is none to slight.

The soils in this unit are moderate in natural fertility, are easy to cultivate, and respond well to good management. Reaction in the subsoil is strongly acid or very strongly acid, but there is no serious limitation to use for crops. The organic-matter content is high in Door soils, moderate in Lydick soils, and low in Tracy soils.

The major management concerns are maintaining organic-matter content and fertility and improving tilth or maintaining good tilth.

These soils are suited to the crops commonly grown in the county. The main crops are corn, soybeans, small grains, or legume-grass mixtures.

Proper use of crop residues, minimum tillage, winter cover crops, a suitable cropping system that includes a grass-legume crop for green manure, and applications of lime and fertilizer help to maintain good tilth and a desirable level of organic-matter content. On these soils many kinds of cropping systems are suitable, including continuous production of corn.

CAPABILITY UNIT IIe-2

This unit consists of deep, well-drained, moderately permeable, gently sloping soils of the Door, Lydick, and Tracy series. These soils are on till plains and outwash terraces of the uplands. The soils have a medium-textured surface layer and a moderately fine textured subsoil.

The soils in this unit are easy to cultivate and respond well to good management. The available moisture capacity is moderate or high, and surface runoff is slow. Where slopes are short, the erosion hazard is slight. Reaction in the subsoil of these soils is strongly acid or very strongly acid. The organic-matter content is low in Tracy soils, moderate in Lydick soils, and high in Door soils.

The major management concerns are controlling erosion, maintaining fertility and organic-matter content, and improving tilth or maintaining good tilth.

The soils in this unit are well suited to all grain and meadow crops commonly grown in the county. Corn and soybeans are the main crops. Also grown are small grains or legume-grass mixtures.

The proper use of crop residues, minimum tillage, winter cover crops, and grass-legume mixtures helps to control erosion, maintain good tilth, and increase fertility. Contour farming and the use of grassed waterways and diversion terraces help control further soil loss. Many kinds of cropping systems are suitable for these soils, including intensively managed cultivated crops. Suitable applications of lime and fertilizer are needed.

CAPABILITY UNIT IIe-6

This unit consists of deep, moderately well drained, medium-textured, gently sloping soils of the Markham and the Morley series. These soils are on till plains of the uplands. The subsoil and underlying material are moderately fine textured and fine textured.

The soils in this unit have slow permeability and high available moisture capacity. They are easy to cultivate, and they respond well to good management. The organic-matter content is low in the Morley soil. It is high in the Markham soil. Surface runoff is medium for both soils, and the erosion hazard is moderate. The major management concerns are controlling erosion and maintaining organic-matter content, fertility, and tilth.

These soils are suited to the crops commonly grown in the county but are better suited to legumes and pasture and meadow grasses. The main crops grown are corn and soybeans.

Proper use of crop residues, winter cover crops, and green-manure crops helps to maintain good tilth and a desirable level of organic-matter content and to control erosion. Minimum tillage, grassed waterways, contour farming, and diversion terracing also help to control erosion and to reduce runoff. Additions of lime and fertilizer are needed. Many kinds of cropping systems are suitable for these soils.

CAPABILITY UNIT IIw-1

This unit consists of deep, poorly drained, and nearly level and depressional soils of the Linwood, Milford, Pewamo, Rensselaer, and Wallkill series. These soils are on lake plains and till plains. They have a medium-textured or moderately fine textured surface layer and a moderately fine textured subsoil.

The soils in this unit are high in organic-matter content and natural fertility. The structure of the surface layer, high in clay content, restricts workability of these soils. Permeability is moderately slow or slow, and available moisture capacity is high. Erosion is a hazard along narrow drainageways during periods of heavy rainfall. Where adjacent slopes are nearly level, surface runoff is very slow or ponded. The water table is at or near the surface late in winter and early in spring. Excess water is a moderate limitation. Milford silty clay loam, sandy substratum, however, is better drained than other soils in this unit because the Milford soil is underlain by sand and gravel at a depth of 40 to 60 inches.

The major management concerns are wetness, surface crusting and puddling, and deficient aeration in the subsoil.

The soils in this unit are well suited to corn, soybeans, some other row crops, and most small grains. They are suited to few legumes and grasses because they are wet.

A suitable drainage system is needed so that these soils warm up soon enough in spring to allow early plowing and planting. Where feasible, diversion terraces can divert surface runoff from adjacent uplands. Erosion control structures and grassed waterways help to reduce the hazard of erosion. Use of minimum tillage, crop residues, and winter cover crops helps to prevent crusting of the surface and to improve tilth. To prevent puddling and to improve permeability, the soils in this unit should not be worked when wet. Many kinds of cropping systems are suitable for these soils, including continuous production of row crops. A cropping system that includes meadow or intercrops of legumes or grasses is especially helpful in maintaining favorable soil structure. Applications of lime and fertilizer are needed.

CAPABILITY UNIT IIw-2

This unit consists of deep, somewhat poorly drained, nearly level soils of the Alida, Blount, Darroch, Del Rey, Elliott, and Whitaker series. These soils are on lake plains, outwash plains, and glacial till plains of the uplands. The soils in this unit have a medium-textured surface layer and a moderately fine textured subsoil.

Organic-matter content is high in the Darroch and Elliott soils and in the Del Rey, dark colored variant; is moderate in the Alida soils; and is low in the Blount and Whitaker soils and in Del Rey silt loam. All of the soils except the Alida soils have high available moisture capacity and slow or moderately slow permeability. The Alida soils have moderate available moisture capacity and moderate permeability.

In this unit, surface runoff is very slow or slow and erosion hazard is slight. The water table is at or near the surface late in winter and early in spring. Excess water is a moderate limitation.

The major management concerns are wetness, maintaining organic-matter content and fertility, and preventing crusting of the surface.

The soils in this unit are suited to corn, soybeans, small grains, and clover. Water-tolerant sweet clover grows better on these wet soils than alfalfa.

Proper use of minimum tillage, crop residues, and winter cover crops helps to prevent surface crusting and to maintain a suitable level of organic-matter content. An adequate drainage system is needed so that these soils warm up soon enough in spring to allow early plowing and planting. They should not be worked when wet. Because the soils in this unit have moderate structure and tend to puddle and run together, minimum tillage should be practiced. Many kinds of cropping systems are suitable for these soils, including continuous cropping to row crops. Lime and fertilizer are needed.

CAPABILITY UNIT IIw-4

This unit consists of deep, poorly drained and very poorly drained soils of the Gilford, Rensselaer, and Wauseon series. These soils are on outwash plains and lake plains in the county. They have a moderately coarse textured or medium-textured surface layer and a moderately coarse textured to moderately fine textured subsoil.

The soils in this unit are high in organic-matter content and natural fertility. Permeability is moderately rapid to moderately slow. The available moisture capacity is moderate in the Gilford soils and is high in the Wauseon soils and in Rensselaer loam, sandy substratum. Surface runoff is very slow or ponded. The water table is at or near the surface late in winter and early in spring. Excess water is a moderate limitation.

The major management problems are wetness, soil blowing, and maintenance of good tilth.

These soils are suited to corn, soybeans, small grains, and clover-grass mixtures. They are well suited to tomatoes, onions, cabbage, carrots, and other special crops.

A suitable drainage system is needed if crops are to grow well (fig. 15). Drainage systems on the soils underlain by sand and gravel must be controlled by special blinding and filters to prevent clogging. Where drainage is suitable, the soils warm up soon enough in spring to allow early plowing and planting. Minimum tillage and proper use of crop residues and winter cover crops reduce soil blowing and help to maintain good tilth. Where the nearly level soils are adjacent to sloping soils, diversion terraces can be used to reduce runoff. Many kinds of cropping systems are suitable for these soils, including continuous cropping to row crops. Applications of fertilizer are needed.

CAPABILITY UNIT IIw-7

The only soil in this unit is Wallkill silt loam, a deep, very poorly drained soil on depressional till plains and lake plains. This soil formed in 10 to 40 inches of medium-textured mineral material over mixed organic materials.

This Wallkill soil is high in organic-matter content and natural fertility. It has very high available moisture capacity and moderate permeability. Surface runoff is very slow or ponded. The water table is at or near the surface late in winter and early in spring.

The major management concerns are controlling wild grass and weeds and maintaining fertility and organic-matter content.

Figure 15.—Open ditches several miles long that serve many farms are common on soils in capability unit IIw-4.

Many kinds of cropping systems are suited to this soil, including the growing of row crops year after year. The main crops are corn and soybeans.

A suitable drainage system is needed to remove excess water, but this soil is difficult to drain where outlets are poor. Suitable drainage promotes good response to fertilizer and permits earlier tillage and planting. Diversion terraces divert water that runs from adjacent higher areas. Minimum tillage and use of crop residues and winter cover crops help to improve tilth, maintain organic-matter content, and control weeds. Chemicals also can be used to control weeds. Additions of fertilizer are needed.

Small areas of this soil are farmed in the same way as adjoining soils. The small, isolated, undrained areas in fence rows or field corners generally are used for grass, trees, or development of wildlife habitat.

CAPABILITY UNIT IIw-11

The only soil in this unit is Watseka loamy sand, moderately deep variant, a deep, somewhat poorly drained soil on outwash plains and lake plains. This soil formed in 18 to 40 inches of coarse-textured outwash materials over moderately fine textured and fine-textured lacustrine material.

This soil is high in organic-matter content and moderate in natural fertility. The sandy material of the surface layer, subsoil, and upper part of the underlying material has very low available moisture capacity and rapid permeability. The underlying clayey material has high available moisture capacity and moderately slow permeability. Surface runoff is very slow.

The major management concerns are wetness, soil blowing, and maintaining suitable levels of organic-matter content and fertility.

Many kinds of cropping systems are suitable for this soil, including continuous use for row crops. Corn, soybeans, tomatoes, onions, cabbage, and carrots are the main crops.

A suitable drainage system is needed so that this soil can warm up soon enough in spring to allow early plowing and planting. Minimum tillage, proper use of crop residues, and winter cover crops help to reduce soil blowing during spring when it is a moderate hazard. These management practices also help to maintain good tilth and fertility. Applications of fertilizer are needed.

CAPABILITY UNIT IIIe-3

The only soil in this unit is Tracy loam, 6 to 12 percent slopes, a deep, well-drained soil on outwash plains. This soil has a medium-textured surface layer, a moderately fine textured subsoil, and coarse-textured underlying material.

Permeability and available moisture capacity are moderate. Natural fertility and organic-matter content are low. Runoff is medium, and the erosion hazard is severe. This soil has good tilth and is favorable for growth of deep-rooted plants. It responds well to good management.

The major management concerns are erosion and low levels of organic-matter content and fertility.

The soil in this unit is suited to crops commonly grown in the county. The main crops are corn, small grains, and meadow. This soil also is suited to trees and to development as wildlife habitat.

Use of winter cover crops and crop residues helps to control erosion. Use of green manure crops helps to maintain and improve organic-matter content, fertility, and tilth. Management practices that include contour farming, stripcropping, and establishing waterways and diversion terraces help to control erosion. Where these practices are not included in management, use of this soil is limited to row crops grown in rotation with close-growing crops. Applications of lime and fertilizer are needed.

CAPABILITY UNIT IIIe-6

This unit consists of deep, moderately well drained, gently sloping and moderately sloping soils of the Morley series. These soils are on glacial till plains of the uplands. The gently sloping, severely eroded soil in this unit is moderately fine textured throughout the profile. The moderately sloping, eroded soil in this unit has a medium-textured surface layer and a moderately fine textured subsoil.

The soils in this unit are low in fertility and organic-matter content. Available moisture capacity is high, and permeability is slow. Surface runoff is medium to rapid.

The severely eroded, moderately fine textured soil in the unit has poor tilth. Many large clods form if this soil is plowed when wet. These clods are extremely hard when dry and are difficult to break down for preparing a successful seedbed. The moderately sloping, medium-textured, eroded soil has good tilth but a severe erosion hazard.

These eroded soils are subject to further soil loss if not properly managed. The major management concerns are increasing the levels of organic-matter content and fertility, improving tilth in the severely eroded soil, and controlling erosion.

These soils are well suited to small grains and meadow plants, but corn and soybeans also are grown.

Use of winter cover crops and crop residues helps to increase and maintain organic-matter content, improves tilth, reduces runoff and thus helps to control erosion. Use of a green manure crop or of barnyard manure can help to improve tilth in the severely eroded soil. In order to avoid the forming of large clods in this soil, all plowing and planting should be done when the level of moisture content is favorable. Additions of lime are needed.

CAPABILITY UNIT IIIe-13

This unit consists of soils that occur on outwash terraces and are deep, gently sloping and moderately sloping, well drained, and moderately coarse textured. These soils are in the Oshtemo series.

The soils of this unit have moderately rapid permeability and low available water capacity. The natural fertility and content of organic matter are moderate. These soils have good tilth and a deep root zone. They are droughty, especially during prolonged dry periods.

The major management concerns are surface runoff and erosion, soil blowing, and drought. Maintaining or improving fertility and organic-matter content also is a concern.

The soils in this unit are well suited to small grains and meadow crops. Corn and soybeans also are grown, but they are subject to damage from drought in some years.

Grassed waterways and winter cover crops help control water erosion. Use of crop residues, barnyard manure, and green manure helps to maintain organic-matter content and good tilth. These practices also aid in reducing soil blowing and in conserving moisture. Applications of fertilizer are needed.

CAPABILITY UNIT IIIw-1

This unit consists of soils in the Maumee series. These nearly level, deep, very poorly drained soils occur on outwash plains. The surface layer is medium textured or coarse textured. The subsoil and the underlying material are coarse textured.

The soils in this unit are high in organic-matter content and natural fertility. They have good tilth. Available moisture capacity is low, and permeability is very rapid or rapid. Runoff is very slow. The water table is at or near the surface late in winter and early in spring. The surface layer of the coarse-textured soil in this unit becomes droughty as the water table falls. This soil, unlike the medium-textured soil in the unit, is then readily leached and subject to severe soil blowing.

The major management concerns are wetness, soil blowing, and the level of fertility.

These soils are well suited to all crops commonly grown in the county. The main crops are corn and soybeans. Also grown are small grains, grasses, legumes, and special crops. Some of the special crops are tomatoes, onions, cabbage, and carrots.

A suitable controlled drainage system is needed, because these soils are droughty if overdrained. If tile is used, special blinding and filters are needed to prevent seepage of sand into the lines. The Maumee soils respond well to practices that control the water table. The proper use of crop residues, cover crops, and minimum tillage helps reduce the moderate hazard of soil blowing during spring. These practices also help maintain the level of fertility. Many kinds of cropping systems are suited to these soils, including continuous use for row crops. Applications of fertilizer are needed.

CAPABILITY UNIT IIIw-2

The only soil in this unit is Bono silty clay, a deep, very poorly drained soil on broad, depressional lake plains. In this soil the surface layer, subsoil, and underlying material are fine textured.

This soil is high in organic-matter content and natural fertility. Available moisture capacity is high, and permeability is very slow. Surface runoff is very slow or ponded, and internal drainage is very slow. This soil has poor tilth and puddles if worked when wet. Because it remains wet until late in spring, field operations are delayed.

The major management concerns are wetness, poor tilth, and surface crusting.

This soil is well suited to all crops commonly grown in the county. The main crops are corn and soybeans. Also grown are small grains, grasses, and legumes.

A well-designed drainage system is needed. If tile is used, a filter of porous material is needed. The proper use of crop residues, cover crops, and minimum tillage helps maintain good tilth. The use of a deep-rooted legume helps promote adequate movement of water and air through the fine-textured layers. To protect soil structure and prevent surface crusting, the soil in this unit should not be worked when wet. Many kinds of cropping systems are suitable. Applications of fertilizer are needed.

CAPABILITY UNIT IIIw-4

This unit consists of deep, somewhat poorly drained, nearly level soils of the Alida and Brady series. These soils are on outwash plains. The surface layer and subsoil are moderately coarse textured, and the underlying material is coarse textured.

The soils in this unit are moderate in organic-matter content and have good tilth. Available moisture capacity is low or moderate, and permeability is moderately rapid or moderate. Surface runoff is very slow. The water table is high late in winter and early in spring.

The major management concerns are wetness, soil blowing, and inadequate levels of organic-matter content and fertility.

These soils are well suited to most crops commonly grown in the county. The main crops are corn and soybeans. Also grown are some small grains, grasses, and legumes. Shallow-rooted crops are subject to damage from drought.

A suitable drainage system is needed because these soils are droughty if overdrained. If tile is used, special blinding and filters are needed to prevent seepage of sand into the lines. Proper use of crop residues, cover crops, and minimum tillage helps reduce soil blowing, which is a moderate hazard in winter and early in spring. These practices also help maintain adequate organic-matter content and fertility. Many kinds of cropping systems are suitable for these soils. Applications of fertilizer are needed.

CAPABILITY UNIT IIIw-8

This unit consists of deep, very poorly drained, organic soils of the Carlisle, Linwood, and Tawas series. These soils are in depressional areas throughout the county. The mixed organic materials are 12 to 42 inches or more thick over coarse-textured, medium-textured, or moderately fine textured mineral soil material or organic material.

The soils in this unit are very high in organic-matter content and have good tilth. Available moisture capacity is very high or moderate. Permeability in the organic layer is moderate and in the underlying material is very rapid to moderately slow. Surface runoff is very slow to ponded.

The major management concerns are wetness and soil blowing.

These soils are well suited to the crops commonly grown in the county. The main crops are corn and soybeans. Also grown are small grains, legume-grass mixtures, and special crops. The special crops are mainly potatoes, onions, and carrots.

A drainage system is needed that provides open ditches for control of the water table. These ditches are supplemented by tile drains after the initial subsidence of the muck. The drainage system needed for the soil underlain by sand must include special blinding and filters over the tile to prevent clogging. This soil is well suited to practices that control the water table, but pumping may

be required where a gravity outlet is not available. Diversion terraces are needed in many places to divert the surface runoff from adjacent upland areas.

On these soils, proper use of crop residues, cover crops, and minimum tillage helps maintain the very high level of organic-matter content. These practices also aid in reducing soil blowing during spring. Many kinds of cropping systems are suitable for these soils, including continuous use for row crops. Sidedressings of fertilizer are needed.

CAPABILITY UNIT IIIs-1

The only soil in this unit is Tyner loamy fine sand, 0 to 6 percent slopes, a deep, well-drained soil on outwash plains. In this soil the surface layer, subsoil, and underlying material are coarse textured.

This soil is low in organic-matter content and natural fertility. It has good tilth and is easy to cultivate. Available moisture capacity is low, and permeability is rapid. Runoff is very slow, and the erosion hazard slight. This soil is strongly acid or very strongly acid.

The major management concerns are droughtiness, soil blowing, and inadequate levels of organic-matter content and fertility.

This soil is poorly suited to small grains and meadow crops. It also is poorly suited to use as woodland and for development of wildlife habitat. This loamy fine sand has severe limitations to use for corn and other crops that require large amounts of water. It is well suited to coniferous plants.

The proper use of crop residues and of cover crops helps improve and maintain levels of organic-matter content and fertility. These management practices also aid in reducing soil blowing, which is a moderate hazard. Applications of lime and fertilizer are needed.

CAPABILITY UNIT IIIs-2

This unit consists of deep, moderately well drained and well drained, nearly level and gently sloping soils of the Sparta and Oshtemo series. These soils are on outwash plains. They have a moderately coarse textured and coarse-textured surface layer and subsoil. They are underlain by coarse-textured or moderately fine textured and fine-textured materials.

The soils in this unit are moderate in organic-matter content. They have low available moisture capacity and moderately rapid permeability. Surface runoff is very slow.

The major management concerns are conserving moisture for plant use, controlling soil blowing, and maintaining suitable levels of organic-matter content and fertility.

These soils are suited to small grains and meadow plants. They are suited to row crops, but crop growth is reduced late in summer because of droughtiness.

The proper use of crop residues, cover crops, and minimum tillage helps control soil blowing and conserves moisture for plants. These practices also aid in improving the levels of organic-matter content and fertility. Early maturing row crops are advantageous. Sidedressings of fertilizer are needed.

CAPABILITY UNIT IVe-4

This unit consists of deep, moderately well drained, medium-textured and moderately fine textured soils of the Morley series. These soils are on till plains of the uplands. The severely eroded soil is moderately sloping, and the eroded soil is strongly sloping.

The soils in this unit have slow permeability and high available moisture capacity. These soils are low in natural fertility and organic-matter content. Surface runoff is rapid. The severely eroded soil is difficult to cultivate. If this soil is plowed when wet, many large clods easily form. The clods are extremely hard when dry and are difficult to break down into a suitable seedbed.

On these soils, the major management concern is controlling surface runoff and the resultant erosion. Other concerns are maintaining suitable levels of organic-matter content and fertility and improving tilth.

These soils are suited to small grains and legume-grass meadow crops. If an area is large enough to be worked as a separate unit, corn and soybeans can be grown under intensive management. Proper use of winter cover crops, green manure crops, and crop residues helps to maintain suitable levels of organic-matter content and fertility, improves tilth, and protects against erosion. Use of diversion terraces, grassed waterways, and minimum tillage helps control surface runoff and erosion. To avoid the forming of large clods, plowing and planting should occur when the moisture content is favorable. Where management practices do not include mechanical measures, permanent vegetative cover reduces runoff and thus decreases erosion. Additions of lime and fertilizer are needed.

CAPABILITY UNIT IVw-4

The only soil in this unit is Watseka loamy fine sand, a deep, somewhat poorly drained, coarse-textured soil that occurs on outwash plains. It formed in sandy glacial drift material that has been reworked by wind.

This soil is high in organic-matter content and is moderate in natural fertility. It has very low available moisture capacity and rapid permeability. Surface runoff is very slow.

The major management concerns are wetness, soil blowing, and inadequate levels of organic-matter content and fertility.

This soil is well suited to small grains, grasses, and legumes. Shallow-rooted plants are subject to damage from drought. Tomatoes, onions, cabbage, carrots, and other special crops are grown.

A suitable, controlled drainage system is needed because this soil is droughty if overdrained. If tile is used, special blindings and filters are needed to prevent seepage of sand into the lines. Proper use of crop residues, cover crops, and minimum tillage, helps reduce soil blowing in winter and early in spring. These practices also help maintain adequate levels of organic-matter content and fertility. Additions of fertilizer are needed. Corn responds well to large applications of nitrogen.

CAPABILITY UNIT IVs-1

This unit consists of deep, moderately well drained and excessively drained soils of the Brems, Sparta, and Plainfield series. These nearly level and gently sloping soils are on outwash plains. The surface layer, subsoil, and underlying material are coarse textured.

The soils in this unit have very low available moisture capacity and very rapid permeability. Surface runoff is very slow because most of the rainfall is absorbed into the soils. The organic-matter content is low in the Plainfield and the Brems soils and is moderate in the Sparta soil.

The major management concerns are droughtiness, soil blowing, and inadequate levels of organic-matter content and fertility.

These soils are poorly suited to hardwood trees, pasture, and wildlife habitat. Limitations to use are severe for corn and other crops that require large amounts of water.

Protective vegetation and limited grazing help to control runoff and thus to decrease erosion.

CAPABILITY UNIT VIe-1

The only soil in this unit is Morley silt loam, 18 to 25 percent slopes, a deep, moderately well drained, medium-textured soil that formed in glacial till. It is on wooded breaks along the major streams of the uplands.

This soil is low in organic-matter content and natural fertility. It is high in available moisture capacity and has slow permeability. Surface runoff is very rapid.

The major management concerns are controlling surface runoff and erosion and maintaining a good vegetative cover.

Although permanent pasture can be established, this soil is too steep and too erodible for cultivation. It is well suited to trees and for development of wildlife habitat. The cleared areas are suited to the grasses and legumes commonly grown in the county.

Limiting grazing, adding lime and fertilizer, and reseeding help to maintain a good cover of permanent grasses and legumes. Pasture renovation by stripcropping on the contour and mulch tillage helps to protect this soil from erosion.

CAPABILITY UNIT VIw-1

This unit consists of Marl beds and Warners silt loam. These nearly level, very poorly drained soils are made up of mixed organic and mineral soil materials over marl. They are in depressional areas of the county. The Marl beds have less than 12 inches of mixed organic materials over highly calcareous marl. The Warners silt loam has 16 inches of mineral soil over marl.

The soils in this unit are high in organic-matter content and in lime content. The available moisture capacity is high or very high, and permeability is slow. Surface runoff and internal drainage are very slow.

The major management concern is wetness.

These soils are suited to most special crops grown in the county. Mainly grown are potatoes, onions, cabbage, and sweet corn. The marl is widely used as a source of lime for farm uses. Undrained areas of both soils in the unit are well suited to use as wildlife habitat.

A suitable drainage system is needed to remove excess water, but drainage outlets are difficult to establish in many places because these soils are low lying.

CAPABILITY UNIT VIs-1

The only soil in this unit is Plainfield fine sand, 6 to 12 percent slopes, a deep, excessively drained, coarse-textured soil on outwash plains and moraines. This soil formed in sandy glacial drift material that has been reworked by wind.

The soil in this unit is low in organic-matter content and natural fertility. It has very low available moisture capacity and very rapid permeability.

The major management concerns are soil blowing, droughtiness, and inadequate levels of organic-matter content and fertility.

This soil is too droughty and too erodible for cultivation, but it can be cultivated enough to establish permanent pasture consisting of drought-resistant grasses and legumes. Protective vegetation and limited grazing help to control runoff and thus to decrease erosion.

This soil is poorly suited to pasture and hardwood trees and to use for development of wildlife habitat. Plantings of suitable coniferous trees are common on this soil.

CAPABILITY UNIT VIIe-1

The only soil in this unit is Morley silty clay loam, 18 to 25 percent slopes, severely eroded. This soil is deep, moderately well drained, and moderately fine textured. It is on glacial till plains.

This soil has slow permeability and high available moisture capacity. It is low in natural fertility and organic-matter content. Surface runoff is very rapid.

The major management concerns are controlling surface runoff so as to decrease erosion and maintain a good vegetative cover.

This soil is suited to pasture but is too steep and too erodible for cultivation. Most areas are wooded or have other permanent cover.

Erosion is the major hazard. A permanent cover of vegetation is needed. Pasture must be protected by limited grazing.

CAPABILITY UNIT VIIIw-1

This unit consists only of Marsh, which occupies shallow lakes and ponds that may be dry during years of less-than-normal precipitation. Most areas, however, remain wet all year. Cattails, rushes, sedges, willows, and other water-tolerant plants grow luxuriantly in these places and provide sanctuary for wild fowl. Muskrat and mink use the large marshes. This capability unit is well suited to these wildlife uses.

CAPABILITY UNIT VIIIs-1

This unit consists of Borrow pits, Oakville fine sand, 12 to 25 percent slopes, Oakville-Tawas complex, 0 to 6 percent slopes, Clay pits, Dune land, Lake beaches, and Urban land.

Borrow pits are areas where the surface layer and subsoil have been removed or disturbed so much that the soil can no longer be identified. These areas are well suited as wildlife habitat.

Oakville fine sand, 12 to 25 percent slopes, is a deep, excessively drained, coarse-textured soil that has been reworked by wind. This soil generally is used as the site for homes. Some of it is used as fill material in road construction. It is suited to coniferous trees and to use for wildlife and recreation.

Oakville-Tawas complex, 0 to 6 percent slopes, is made up of areas of Oakville fine sand and of Tawas muck. The

excessively drained fine sand is on the elevated ridges, and the very poorly drained muck is in the sloughs. About half of the acreage of the complex is fixed by forest vegetation, and the rest is swampy grassland. This complex is suited to coniferous trees and to use for wildlife or recreation.

Clay pits are areas that have been stripped of the surface layer and subsoil. The material from these layers is high in clay content and is used mainly for making brick. These areas of the capability unit are well suited to use for wildlife. Tree plantings improve wildlife habitat.

Dune land consists of hills or ridges of sand that has been drifted and piled by the wind along the beach of Lake Michigan. Dune land is a source of sand to be used for fills. In the Gary industrial district, much of this land type is used for building sites. Many of these areas are used for recreation.

Lake beaches are along the southern shores of Lake Michigan in the northern part of the county. They are used for harbors and industrial developments. These areas are well suited to use for recreation.

Urban land consists of areas where the surface layer and subsoil have been removed or have been disturbed so much that the soil can no longer be identified. Most of this land is in and around communities and built-up areas.

Yield predictions [3]

Table 2 lists estimated average acre yields of the principal crops grown under two levels of management on soils of the county that are suitable for cultivation. These predicted average yields are for a period of 5 to 10 years. They are based on data from farm records; on interviews with farmers, with members of the staff of the Purdue Agricultural Experiment Station, and with others familiar with farming in the county; and on direct observation by soil scientists and district conservationists of the Soil Conservation Service. The factors considered in predicting the yields were prevailing climate, characteristics of the soils, and influence of different kinds of management practices.

In columns A are shown yields to be expected under management commonly used, and in columns B are shown yields to be expected under improved, high-level management now used by some farmers in the county.

It should be understood that these estimates may not apply directly to any specific tract of land for any particular year, because soils range somewhat in properties from place to place, management practices differ slightly from farm to farm, and weather conditions vary from year to year. Nevertheless, these predicted yields appear to be as accurate a guide as can be obtained without further, detailed, lengthy investigations. The information given in table 2 is useful in showing the relative productivity of the soils and how they respond to improved management.

The management needed to get the estimated yields given in columns A includes (a) using a cropping system that maintains tilth and organic-matter content, (b) using erosion control practices that reduce erosion, (c) applying the required amounts of fertilizer and lime determined by soil tests, (d) returning crop residues to the soil, (e) plowing and tilling by conventional methods, (f) choosing crop varieties that generally are suited to the climate and soils, (g) controlling weeds moderately well through till-

[3] HAROLD KRACHT, district conservationist, Soil Conservation Service, assisted in writing this section.

TABLE 2.—*Estimated average acre yields of specified crops under two levels of management*

The estimated yield figures for all crops are plus or minus 10 percent. The figures in columns A indicate yields under common management; those in columns B indicate yields under improved management. Absence of a figure indicates that the crop is not commonly grown on the soil, that the crop is not suited to the soil, or that the soil is not arable]

Soils	Corn		Soybeans		Wheat		Oats		Hay: Alfalfa or alfalfa-grass mixtures		Hay: Clover-grass mixtures	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Alida fine sandy loam	65	80	25	35	30	40	40	55			2.0	3.0
Alida loam	80	100	30	40	35	45	55	75	3.0	5.0	2.0	3.0
Blount silt loam, 0 to 2 percent slopes	80	100	30	40	35	45	55	75	3.0	5.0	2.0	3.0
Bono silty clay	85	100	30	40	25	35	60	80	3.2	3.8	2.8	3.5
Borrow pits												
Brady fine sandy loam	65	80	25	35	30	40	40	55			2.0	3.0
Brems fine sand, 0 to 4 percent slopes	30	50	15	20	12	18	25	35	1.5	2.0	.75	1.0
Carlisle muck	80	110	25	40								
Clay pits												
Darroch loam	80	100	30	40	35	45	55	75	3.0	5.0	2.0	3.0
Del Rey silt loam	80	100	30	40	35	45	55	75	3.0	5.0	2.0	3.0
Del Rey silt loam, dark colored variant	80	100	30	40	35	45	55	75	3.0	5.0	2.0	3.0
Door loam, 0 to 2 percent slopes	75	105	30	40	37	45	60	80	3.5	5.0	2.5	3.0
Door loam, 2 to 6 percent slopes	70	90	28	35	30	45	55	70	3.0	5.0	2.0	3.0
Door loam, silty clay loam substratum, 2 to 6 percent slopes	75	95	30	38	30	45	55	70	3.3	3.3	2.0	3.0

TABLE 2.—*Estimated average acre yields of specified crops under two levels of management*—Continued

Soils	Corn		Soybeans		Wheat		Oats		Hay: Alfalfa or alfalfa-grass mixtures		Hay: Clover-grass mixtures	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Dune land												
Elliott silt loam	80	100	30	40	35	45	55	75	3. 0	5. 0	2. 0	3. 0
Gilford fine sandy loam	75	110	25	35	30	40	50	70	2. 5	3. 0	2. 5	3. 0
Gilford mucky fine sandy loam	75	110	25	35	30	40	50	70	2. 5	3. 0	2. 5	3. 0
Gilford loam	75	110	25	35	30	40	50	70	2. 5	3. 0	2. 5	3. 0
Lake beaches												
Linwood muck	80	100	25	38								
Lydick loam, 0 to 2 percent slopes	75	105	30	40	37	45	60	80	3. 5	5. 0	2. 5	3. 0
Lydick loam, 2 to 6 percent slopes	70	95	28	38	35	45	55	75	3. 0	4. 5	2. 0	3. 0
Markham silt loam, 2 to 6 percent slopes, eroded	70	100	28	35	30	45	55	70	3. 0	5. 0	2. 0	3. 0
Marl beds	40	55	12	22								
Marsh												
Maumee loamy fine sand	75	110	25	35	30	45	45	65			2. 5	3. 0
Maumee silt loam	75	110	25	35	30	45	45	65			2. 5	3. 0
Milford silt loam, overwash	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Milford silty clay loam	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Milford silty clay loam, sandy substratum	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Milford-Linwood-Wallkill complex	75	100	25	35	30	40	55	75				
Morley silt loam, 2 to 6 percent slopes	60	80	25	30	25	35	42	60	2. 5	3. 5	2. 0	2. 5
Morley silt loam, 6 to 12 percent slopes, eroded	55	80	20	30	28	35	45	60	2. 5	3. 5	1. 5	2. 5
Morley silt loam, 12 to 18 percent slopes, eroded	40	65			18	28	35	45	2. 5	3. 0	1. 5	2. 5
Morley silt loam, 18 to 25 percent slopes									1. 5	2. 5	1. 0	1. 6
Morley silty clay loam, 2 to 6 percent slopes, severely eroded	55	80	18	22	28	35	45	60	2. 5	3. 5	1. 5	2. 5
Morley silty clay loam, 6 to 12 percent slopes, severely eroded	40	65			18	28	35	45	2. 5	3. 0	1. 5	2. 5
Morley silty clay loam, 18 to 25 percent slopes, severely eroded									1. 5	2. 5	1. 0	1. 5
Oakville fine sand, 12 to 25 percent slopes												
Oakville-Tawas complex, 0 to 6 percent slopes												
Oshtemo fine sandy loam, 0 to 2 percent slopes	50	75	23	32	20	30	35	45	2. 0	3. 0	1. 2	1. 5
Oshtemo fine sandy loam, 2 to 6 percent slopes	50	75	20	30	25	30	40	60	2. 0	3. 0	1. 5	2. 5
Oshtemo fine sandy loam, 6 to 12 percent slopes	50	75	20	30	25	30	40	60	2. 0	3. 0	1. 5	2. 5
Pewamo silty clay loam	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Pewamo silty clay loam, calcareous variant	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Plainfield fine sand, 0 to 6 percent slopes	30	50	15	20	12	18	25	35	1. 5	2. 0	. 75	1. 0
Plainfield fine sand, 6 to 12 percent slopes									1. 5	2. 0	. 75	1. 0
Rensselaer loam	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Rensselaer loam, sandy substratum	75	110	25	35	30	40	50	70	2. 5	3. 0	2. 5	3. 0
Rensselaer mucky loam, sandy substratum	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Rensselaer loam, calcareous subsoil variant	80	110	30	40	35	45	60	80	3. 0	5. 0	2. 0	3. 0
Sparta fine sand, 0 to 4 percent slopes	30	50	15	20	12	18	25	35	1. 5	2. 0	. 75	1. 0
Sparta fine sand, silty clay loam substratum, 0 to 4 percent slopes	50	70	18	25	20	30	40	55	2. 5	3. 5	1. 5	2. 7
Tawas muck	65	90	25	35								
Tracy loam, 0 to 2 percent slopes	75	105	30	40	37	45	60	80	3. 5	5. 0	2. 5	3. 0
Tracy loam, 2 to 6 percent slopes	65	90	25	35	32	40	50	65	3. 0	4. 0	2. 0	3. 0
Tracy loam, 6 to 12 percent slopes	55	85	20	30	38	38	50	60	2. 7	4. 5	2. 0	3. 0
Tracy loam, silty clay loam substratum, 2 to 6 percent slopes	70	95	27	38	32	40	50	65	3. 2	4. 0	2. 0	3. 0
Tyner loamy fine sand, 0 to 6 percent slopes	50	65	23	28	35	40	35	45	2. 0	3. 0	1. 2	1. 5
Urban land												
Wallkill silt loam	70	90	25	35	15	25	30	45	2. 0	2. 5	1. 5	2. 5
Warners silt loam	65	95	25	35	20	35	40	50	1. 5	2. 5	1. 3	2. 0
Watseka loamy fine sand	40	55	15	25	20	35	35	50	2. 0	3. 0	1. 5	2. 0
Watseka loamy sand, moderately deep variant	65	90	25	35	25	35	50	65	3. 0	4. 0	2. 0	3. 0
Wauseon fine sandy loam	75	110	23	38	30	45	45	65			2. 5	3. 0
Whitaker loam	80	100	30	40	35	45	55	75	3. 0	5. 0	2. 0	3. 0

ing and spraying, and (h) draining wet soils well enough for cropping, even though yields are somewhat restricted.

The management needed to get the estimated yields in columns B includes (a) using a cropping system that maintains tilth and organic-matter content, (b) using maximum cultural and mechanical practices that help to control erosion and that maintain or improve, if possible, the qualities of the soil, (c) maintaining the supply of available plant nutrients at high levels as determined by frequent soil tests made according to recommendations of the State Agricultural Experiment Station, (d) liming in accordance with such recommendations, (e) using crop residues to the fullest extent for protection and improvement of the soil, (f) using minimum tillage, (g) choosing only the most suitable crop varieties, (h) controlling weeds thoroughly by tillage and spraying, and (i) draining wet soils so that wetness does not restrict yields.

Special crops [4]

Special crops are grown on about 3 percent of the cropland in Lake County and account for about 10 percent of the gross farm income. The main special crops are sweet corn, potatoes, onions, radishes, carrots, asparagus, cabbage, lettuce, peppers, snapbeans, pumpkins, squash, melons, cucumbers, strawberries, tomatoes, mint, and blueberries.

To facilitate management, the soils of this county have been placed in special crop groups. The soils in a given group are similar in their suitability for special crops and the management they need. The groupings take into account organic-matter content, texture, drainage, erosion, percent of slope, and potential productivity of the soils.

The eight special crop groups are described in the following pages. To find the special group for any given soil, refer to the "Guide to Mapping Units" at the back of this survey.

SPECIAL CROP GROUP 1

This group consists of organic soils that generally have 12 to 42 inches or more of muck over mineral soil material. These soils are underlain by marl or by materials of coarse, moderately coarse, medium, or moderately fine texture. In some places less than 12 inches of muck overlies the marl.

These soils have good tilth and are very high in organic-matter content. The available moisture capacity is high or very high. Surface runoff is very slow or ponded, and permeability of the muck is moderate.

The soils in this group have a high water table and need a drainage system that removes excess water. Soil blowing is a hazard if the surface layer is dry and not protected by a plant cover.

Under good management that provides suitable drainage, the soils in this group are well suited to most special crops. Where these soils are very strongly acid, they are well-suited to blueberries. They are not suited to pumpkins, squash, melons, cucumbers, strawberries, and other low-growing vine crops.

[4] CLAY HURT, area conservationist, Soil Conservation Service, and KENNETH A. WENNER, county extension agent in soils, Purdue University, assisted in writing this section.

SPECIAL CROP GROUP 2

This group consists of deep, somewhat poorly drained to very poorly drained soils on nearly level or depressional outwash and lake plains. These soils have a coarse-textured to medium-textured surface layer and a coarse-textured to moderately fine textured subsoil. In most places the underlying material is coarse textured in the outwash soils and moderately fine or fine textured in the lacustrine soils. In places less than 12 inches of muck is over the mineral soil.

These soils have good tilth, and they are moderate or high in organic-matter content and natural fertility. The available water capacity is very low to moderate, and runoff is very slow or ponded. Water moves readily through most of these soils. The water table is at or near the surface in spring. If the soils are drained, however, they warm up early in spring and can be tilled and planted earlier than when wet. Soil blowing is a hazard if the soils are not protected by a plant cover.

Under good management that provides adequate drainage, most soils in this group are well suited to all special crops commonly grown in the county (fig. 16). The soils that have a mucky surface, however, are not suited to pumpkins, squash, melons, cucumbers, strawberries, and other low-growing vine crops.

SPECIAL CROP GROUP 3

This group consists of deep, poorly drained and very poorly drained, nearly level or depressional soils on uplands. These soils have a moderately fine textured or fine-textured surface layer and subsoil.

The soils in this group are high in organic-matter content and natural fertility but have poor tilth. Permeability is very slow or slow, and surface runoff is very slow or ponded. Internal drainage is very slow, and available moisture capacity is high. These soils are wet until late in spring. If they are cultivated when wet, they puddle and hard clods form.

Soils in this group generally are poorly suited to special crops because slow permeability and drainage make tillage difficult.

SPECIAL CROP GROUP 4

This group consists of deep, somewhat poorly drained and poorly drained, nearly level or depressional soils on uplands. These soils have a medium-textured surface layer. The subsoil and underlying material are moderately fine textured and fine textured.

The soils in this group have high available moisture capacity and moderately slow to very slow permeability. Surface runoff is very slow or ponded. Because the water table is at or near the surface in spring, an adequate drainage system is needed to remove the excess water. These soils should not be worked when wet if good tilth is to be maintained.

Under improved management that includes adequate drainage, the soils in this group are moderately well suited to all special crops. Wetness delays tillage.

SPECIAL CROP GROUP 5

This group consists of deep, moderately well drained, gently sloping soils on uplands. These soils have a

Figure 16.—**Cabbage on Watseka loamy sand, moderately deep variant, in special crop group 2.**

medium-textured surface layer. The subsoil and underlying material are moderately fine textured and fine textured.

The soils in this group have high available moisture capacity and slow permeability. The surface layer is in good tilth but, because of the texture of the subsoil, remains wet for short periods after rainfall. Because slopes are gentle, the erosion hazard is moderate.

Under improved management these soils are well suited to all special crops. During wet periods, slow permeability delays tillage.

SPECIAL CROP GROUP 6

This group consists of deep, moderately well drained and well drained, nearly level and gently sloping soils on outwash and lake plains. These soils have a coarse-textured or medium-textured surface layer.

The soils in this group are moderate in natural fertility and available moisture capacity. They are easy to cultivate and can be worked shortly after a rain because the water soaks into the surface layer very rapidly. These soils are strongly acid and very strongly acid. Surface runoff is very slow or slow. Because slopes are gentle, the erosion hazard is only slight.

Under improved management these soils are well suited to most special crops grown in the county, except that unless irrigated the soils might be somewhat droughty for potatoes and snapbeans.

SPECIAL CROP GROUP 7

This group consists of deep, moderately well drained to excessively drained, nearly level and gently sloping soils on outwash plains. In these soils the surface layer, subsoil, and underlying material are coarse textured.

The soils in this group have very low available moisture capacity and very rapid permeability. They are droughty and do not hold enough moisture for crops. These soils are subject to severe soil blowing if a cover of vegetation is not maintained.

The soils in this group are poorly suited to special crops unless management is good and includes irrigation (fig. 17).

SPECIAL CROP GROUP 8

This group consists of moderately well drained to excessively drained soils. These soils mainly are moderately sloping, strongly sloping, and steep, but included is one soil that has slopes of less than 6 percent. The

surface layer in these soils is coarse textured to moderately fine textured.

The soils in this group are low in organic-matter content and fertility and have poor tilth. Droughtiness also is a severe limitation on the sandy soils in this group. Surface runoff is medium to very rapid, and erosion hazard is severe. Gullies are likely to form if adequate erosion control practices are not established and maintained.

If these soils are cultivated, management practices should include contour farming, stripcropping, establishing waterways and diversions, and terracing so as to help control runoff and thus reduce erosion. Use of green manure crops also should be included to help maintain and improve organic-matter content, fertility, and tilth.

The soils in this group are poorly suited to special crops because of the severe erosion hazard and droughtiness.

Engineering Uses of the Soils

Some soil properties are of special interest to engineers because those properties affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and degree of acidity or alkalinity. Depth to seasonal high water table, depth to bedrock, and topography also are important. In this section emphasis is placed on interpretation of these properties in the soils of Lake County so that the information may be used by engineers and others to—

1. Make studies that aid in selecting and developing sites for industrial, business, residential, and recreational uses.
2. Make preliminary evaluations that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning detailed investigations at the selected sites.
3. Assist in designing drainage systems, farm ponds, diversion terraces, and other structures for soil and water conservation.

Figure 17.—**Landscape nursery on irrigated Sparta fine sand, 0 to 4 percent slopes, in special crop group 7.**

4. Locate possible sources of sand and gravel and other construction materials.
5. Correlate kinds of soils with the performance of existing engineering structures and thus gain information that will aid in planning design and maintenance of newer structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The information in this section was obtained by combining the knowledge of engineers and soil scientists with information obtained from laboratory tests and from field experience.

With the use of the soil map for identification, the estimates of interpretations made here can be useful for many purposes. It should be emphasized, however, that these estimates and interpretations are not substitutes for sampling and testing needed at a site chosen for a specific engineering work where heavy loads are involved or at a site where the excavations are to be deeper than the depth here reported. But even in these situations, the soil map and other parts of the survey are useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by soil scientists may be unfamiliar to the engineer, and some terms may have special meaning in soil science. These and other special terms used in the soil survey are defined in the Glossary at the back of this survey.

Much of the information in this section is in tables 3, 4, and 5. Table 3 gives test data obtained from the testing of samples taken from soils in Lake County. These samples do not represent the entire range of soil characteristics in Lake County, or even within the seven soil series, and not all layers of each profile were sampled. The test results have been used as a general guide in estimating the engineering properties of the soils in the county, and these estimates are given in table 4. In table 5, the soils are rated as a source of materials used in road construction and named are soil features that adversely affect engineering structures and practices.

In addition to the information in this section, other information valuable to engineers is included in the soil survey. The sections "How This Survey Was Made" and "Descriptions of the Soils" are particularly helpful. In the section "Town and Country Planning," the degree of limitation for selected nonfarm uses is rated and the chief limiting properties are given.

Engineering classification systems

The engineering classification systems most widely used are the system approved by the American Association of State Highway Officials (AASHO) (*1*) and the Unified system (*8*). These systems classify soil material according to gradation and plasticity characteristics. The USDA textural classification (*6*) is used by soil scientists. All three of these systems are used in this soil survey.

The AASHO classification system is used by many highway engineers. In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clayey soils having low strength when wet.

In each of the seven groups, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in table 3 in parentheses following the soil group symbol, for example, A–4(8) or A–7–6(15).

The Unified classification system, preferred by some engineers, was developed by the Waterways Experiment Station, Corps of Engineers, and is now in use by the United States Department of Defense. In this system soil materials are classified according to their texture and plasticity, and are grouped according to their performance as engineering construction materials. Soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic (one class). An approximate classification by this system can be made in the field.

Engineering test data

Samples from profiles of seven principal soil series in Lake County were taken from nine locations selected by soil scientists. The samples chosen for testing were those most nearly modal for the soil series as they occur in this county. Only selected layers of each profile were sampled.

Table 3 lists the soils tested and notes the locations from which the samples were taken. It specifies the materials in which these soils formed, shows the Indiana report number assigned the tests, and gives data resulting from the tests.

In the moisture-density (compaction) test, soil material is compacted into a mold several times with a constant compacting effort, each time at progressively higher moisture content. The density, or unit weight, of the compacted material increases as the moisture content increases until optimum moisture content is reached. After that, the density *decreases* with *increase* of moisture content. The highest density obtained in the compaction test is the *maximum dry density*, and the corresponding moisture content is the *optimum moisture*. Moisture-density data are important to earthwork because optimum stability is obtained if a soil is compacted to about maximum dry density at approximately optimum moisture.

The engineering classifications in table 3 are based on mechanical analysis and on tests that determine the liquid limit and the plasticity index of the soils. Mechanical analysis was made by combined sieve and hydrometer methods. The results are useful in determining the relative proportions of the different sized particles. The percentages of clay obtained by the hydrometer method are not used for naming soil textural classes, since soil scientists determine percentage of clay by the pipette method. To soil scientists "clay" refers to mineral grains

of less than 0.002 millimeter in diameter. Engineers, on the other hand, many times define "clay" as particles less than 0.005 millimeter in diameter.

Estimated engineering properties

In table 4 soil properties that are significant to engineering are estimated. Since actual tests were made only on those soils listed in table 3, estimates were made of the engineering properties of the remaining soils. The estimates are based on comparisons with data in table 3 and on other experience with the soils in the survey area, or on observations of similarly classified soils in other areas. These estimates provide information that an engineer would have to obtain otherwise. They are not, however, substitutes for the detailed tests needed at specific sites selected for construction.

Depth to seasonal high water table for each soil in the county is shown in table 4. The figures given represent the highest annual level measured in feet from the surface.

Depth from surface is given in inches for major horizons or for special horizons that have engineering properties significantly different from those of adjacent horizons.

Dominant USDA texture is based on the classification used by the United States Department of Agriculture, which establishes textural class names, such as "sand," "sandy loam," "silt loam," "sandy clay loam," and "clay," according to the relative amounts of sand, silt, and clay. Also listed are the Unified and the *AASHO* classifications for the soils.

Percentage passing sieve shows percentages of material that pass through the No. 10 (2.0 millimeters), No. 40 (0.42 millimeter), and No. 200 (0.075 millimeter) sieves and thus indicate the grain-size distribution in a soil.

Permeability is estimated according to the rate at which water moves through undisturbed soil material. Estimates are based largely on soil texture, structure, and consistence and are expressed in inches per hour.

Available moisture capacity is the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction indicates the degree of acidity or alkalinity of the soil layer and is expressed in pH values.

Frost-heave potential refers to the heave caused by the formation of ice lenses in the soils and subsequent loss of strength as a result of excess moisture during periods of thaw. For frost-heave potential to be a major consideration, there must be a susceptible soil, a source of water during the freeze period, and low temperature for a period long enough for the ground to freeze.

Shrink-swell potential indicates the volume change to be expected with a change in moisture content. These estimates are based primarily on the amount and kind of clay in the soil.

Engineering interpretations

Table 5 gives, for each soil in Lake County, interpretations of soil features that may affect suitability for engineering uses. The data in this table apply to the typical profile described for each soil series in the section "Descriptions of the Soils." The information given is based on the estimated data in table 4, on the actual tests reported in table 3, and on field experience.

A soil feature may be helpful in one kind of engineering work, but in another kind, may be a hindrance. For example, a soil that has a highly permeable substratum is not suitable as a site for a farm pond but may be suitable as a highway location.

Following is a brief explanation of the heading for each column in table 5.

Topsoil refers to soil material, generally the surface layer, that is used to topdress back slopes, embankments, lawns, and gardens. The suitability rating is based mainly on texture, content of organic matter, susceptibility to erosion, and depth to water table.

For *sand and gravel*, the suitability ratings of the soil material are given to a depth of 5 to 7 feet. Sand or sand and gravel occur at varying depths, even within soils of the same series. A test pit is needed at each site to determine the extent and availability of these materials.

For *road subgrade material*, suitability ratings are based on the performance of soils that have been removed from borrow pits for use as subgrade. Ratings for the soils listed in this table are given for both the subsoil and the substratum if these layers have contrasting characteristics.

The soil features considered for *highway location* are those that affect overall performance of an undisturbed soil that has not been artificially drained. The entire profile is evaluated. Some of the features are susceptibility to frost heave, texture, shrink-swell potential, and depth to seasonal high water table.

For *agricultural drainage*, the features considered are those that affect the installation and performance of drainage systems, both on the surface and beneath it. Some of the features are texture, permeability, topography, seasonal high water table, and restricting layers.

For building *pond reservoirs*, the feature of primary concern is permeability because it affects seepage.

Pond embankments, dikes, and levees are built with disturbed soil material and are used to impound surface water. Among the features affecting the suitability of soil material for use in such structures are stability, compaction, compressibility, shrink-swell potential, permeability, and depth to water table.

Suitability for *grassed waterways* depends on soil features that affect the establishment, growth, and maintenance of vegetation and the layout and construction of the waterways.

For *foundations of low buildings*, the degree of limitation of a soil depends on characteristics of the substratum, which provides the "base" for most buildings. Table 5 gives data on those characteristics that affect use of the soils as foundations of buildings of up to 3 stories high. Some of the limiting features are poor bearing strength, unstable material, high shrink-swell potential, and a seasonally high or a perched water table.

For *septic tank disposal fields*, permeability, seasonal water table, flooding hazard, and topography are among the features evaluated for use of the soils.

TABLE 3.—*Engineering*

[These tests were performed in the laboratories of Purdue University under joint sponsorship of the Indiana State Highway Department State Highway

Soil name and location of sample	Parent material	SCS sample S63 Ind. 45–	Depth from surface	Moisture-density data [1]		Mechanical analysis [2]		
				Maximum dry density	Optimum moisture content	Percentage passing sieve— ¾-in.	⅜-in.	No. 4 (4.7 mm.)
			In.	*Lb./cu. ft.*	*Pct.*			
Bono silty clay: NE¼NE¼NE¼, sec. 1, T. 35 N., R. 10 W. (Modal profile)	Silty clay glacial lacustrine material (Wisconsin age).	3–1	0–10	94	24	----------	100	99
		3–2	21–39	105	19	----------	100	99
		3–3	39–45	105	19	----------	100	99
Door loam: SW¼SW¼NW¼, sec. 12, T. 35 N., R. 8 W. (Modal profile)	Glacial outwash deposits.	9–1	0–8	97	23	----------	100	98
		9–2	17–28	113	15	----------	100	99
		9–3	46–55	120	12	----------	100	90
NE¼SE¼SW¼, sec. 10, T. 35 N., R. 8 W. (Light-textured B horizon)	Glacial outwash deposits.	4–1	0–12	105	19	----------	----------	100
		4–2	24–34	121	11	100	93	79
		4–3	56–83	120	12	100	92	85
Elliott silt loam: NW¼NW¼SE¼, sec. 19, T. 35 N., R. 8 W. (Modal profile)	Silty clay loam glacial till (Wisconsin age).	1–1	0–8	94	25	----------	----------	100
		1–2	19–26	103	20	----------	----------	100
		1–3	32–50	116	13	----------	100	99
Markham silt loam: SW¼NW¼SE¼, sec. 19, T. 35 N., R. 8 W. (Modal profile)	Silty clay loam glacial till (Wisconsin age).	2–1	0–9	100	21	----------	----------	----------
		2–2	15–24	99	22	----------	100	99
		2–3	28–34	112	16	100	99	96
Milford silty clay loam: SW¼NW¼NW¼, sec. 36, T. 35 N., R. 8 W. (Modal profile)	Glacial lacustrine material (Wisconsin age).	8–1	0–9	96	24	100	99	99
		8–2	17–26	112	16	----------	100	99
		8–3	43–52	116	13	100	99	98
Rensselaer loam, sandy substratum: NW¼NW¼SW¼, sec. 35, T. 33 N., R. 8 W. (Modal profile)	Glacial outwash deposits.	7–1	0–9	96	24	----------	100	99
		7–2	16–33	118	13	----------	100	99
		7–3	45–70	107	13	----------	100	100
SW¼SW¼SW¼, sec. 33, T. 33 N., R. 8 W. (Interbedded silt and sand horizon)	Glacial outwash deposits.	6–1	0–8	108	17	----------	----------	100
		6–2	19–29	114	14	----------	----------	100
		6–3	42–56	103	9	----------	----------	----------
Tracy loam: NW¼NW¼NW¼, sec. 33, T. 33 N., R. 8 W. (Modal profile)	Glacial outwash deposits.	5–1	0–8	98	22	----------	100	99
		5–2	21–35	110	16	100	99	98
		5–3	46–53	123	12	100	99	96

[1] Based on AASHO Designation: T 99–57, Method C (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88–57. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes of soils.

test data

and the U.S. Department of Commerce, Bureau of Public Roads, in accordance with standard procedures of the American Association of Officials (AASHO) (*1*)]

Mechanical analysis [2]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued			Percentage smaller than—						AASHO	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
							Pct.			
99	97	80	77	67	48	34	49	21	A-7-6(14)	ML or CL
99	96	79	77	69	54	45	53	36	A-7-6(18)	CH
99	97	88	87	78	60	45	46	24	A-7-6(15)	CL
93	80	53	48	37	21	14	32	6	A-4(4)	ML
96	85	47	46	37	21	16	29	13	A-6(3)	SC
63	44	21	20	18	14	10	29	11	A-2-6(0)	SC
99	90	53	53	40	25	20	30	6	A-4(4)	ML or CL
56	42	23	23	21	15	10	24	6	A-1-b(0)	SM-SC
70	52	28	27	23	15	12	24	6	A-2-4(0)	SM-SC
99	93	88	85	73	41	23	42	14	A-7-6(10)	ML
99	95	84	81	72	52	38	52	27	A-7-6(17)	CH
97	92	83	83	74	53	38	34	16	A-6(10)	CL
100	95	82	80	68	38	25	41	18	A-7-6(11)	CL
99	97	96	94	87	66	50	53	28	A-7-6(18)	CH
90	93	89	87	79	54	38	37	18	A-6(11)	CL
98	97	81	79	67	43	23	36	10	A-4(8)	ML or OL
98	93	71	70	56	35	25	44	25	A-7-6(15)	CL
94	89	71	66	48	29	23	31	14	A-6(9)	CL
97	89	59	40	29	18	13	34	7	A-4(5)	ML
98	86	41	39	34	23	15	24	10	A-4(1)	SC
99	90	9	8	7	6	6	(4)	(4)	A-3(0)	SP-SM
98	93	74	55	39	20	10	40	18	A-6(11)	CL
98	87	43	42	33	23	22	25	10	A-4(2)	SC
100	97	9	8	6	5	5	(4)	(4)	A-3(0)	SP-SM
99	96	75	70	----------	----------	13	28	6	A-4(2)	ML
93	81	58	53	46	28	21	33	14	A-6(6)	CL
90	64	40	37	30	21	14	16	2	A-4(1)	SM

[3] SCS and BPR have agreed that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of the borderline classification obtained by this use is SM-SC.

[4] Nonplastic.

TABLE 4.—*Estimated engineering*

[Depth to bedrock is not included in this table, because all soils

Soil series and map symbols [2]	Depth to seasonal high water table	Depth from surface	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Alida: Ad, Al	1-4	0-11	Loam and fine sandy loam	ML	A-4
		11-44	Sandy clay loam and clay loam	CL	A-6
		44-60	Sand and gravel	SM	A-1 or A-2
Blount: BlA	[3] 1-4	0-12	Silt loam	ML or CL	A-4
		12-36	Silty clay loam	CL	A-6 or A-7
		36-60	Silty clay loam	CL	A-6
Bono: Bn	[4] 0-1	0-21	Silty clay	OL, ML or CL	A-7
		21-39	Silty clay	CH	A-7
		39-60	Silty clay	CL	A-7
Brady: Br	1-4	0-10	Fine sandy loam	SM	A-2-4
		10-25	Fine sandy loam	SM	A-4
		25-60	Fine sand	SP or SP-SM	A-2 or A-3
Brems: BsB	1-4	0-60	Fine sand	SM	A-2
Carlisle: Ca [4]	[5] 0-1	0-60	Muck over peat	Pt	
Darroch: Da	1-4	0-13	Loam	ML or CL	A-4
		13-38	Loam and clay loam	ML or CL	A-4 or A-6
		38-60	Silt and fine sand	ML	A-4
Del Rey:					
De	1-4	0-8	Silt loam	ML or CL	A-4
		8-38	Silty clay loam and clay loam	CL	A-6 or A-7
		38-60	Silty clay loam	CL	A-7
Dl	1-4	0-13	Silt loam	ML or CL	A-4
		13-48	Silty clay loam	CL	A-6 or A-7
		48-60	Silty clay loam	CL	A-7
Door:					
DoA, DoB	>4	0-17	Loam	ML	A-4
		17-35	Clay loam	SC or CL	A-6
		35-60	Sand and gravel	SC	A-2
DrB	>4	0-17	Loam	ML	A-4
		17-46	Clay loam or sandy clay loam	SC or CL	A-6
		46-60	Silty clay moal	CL	A-6
Dune land: Du	>4	0-60	Fine sand	SP or SP-SM	A-3
Elliott: El	[3] 1-4	0-15	Silt loam	ML or OL	A-6 or A-7
		15-26	Silty clay loam and silty clay	CL or CH	A-7
		26-60	Silty clay loam	CL or CH	A-6 or A-7
Gilford: Gd, Gf, Gm	[4] 0-1	0-11	Fine sandy loam or loam	SM or ML or OL	A-4
		11-38	Fine sandy loam	SM	A-2-4
		38-60	Sand and gravel	SM	A-2-4
Linwood: Lm [5]	[4] 0-1	0-22	Muck	OL	A-5
		22-60	Silty clay loam	CL or OH	A-7
Lydick: LyA, LyB	>4	0-10	Loam	ML	A-4
		10-55	Clay loam and sandy clay loam	CL	A-6
		55-70	Sand and gravel	SC	A-2 or A-4
Markham: MaB2	>4	0-10	Silt loam	CL	A-6 or A-7
		10-30	Silty clay loam and silty clay	CH	A-7
		30-60	Silty clay loam	CL	A-6
Marl beds: Mb [5]	[4] 0-1	0-9	Muck	OL	A 5
		9-36	Marl		
		36-72	Silt loam	ML or MH	A-7

See footnotes at end of table.

properties of the soils [1]

in Lake County are so deep that bedrock does not affect use]

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
95–100	85–90	50–60	0. 63–2. 00	0. 16	5. 6–6. 0	High	Low.
90–95	80–85	55–65	0. 63–2. 00	. 16	5. 1–5. 5	Moderate	Moderate.
60–70	40–50	20–30	6. 30–20. 00	. 04	6. 1–6. 5	Low	Low.
95–100	90–100	85–95	0. 63–2. 00	. 20	6. 1–6. 5	High	Low.
95–100	90–100	80–90	0. 06–0. 20	. 18	5. 1–5. 5	Moderate	Moderate.
95–100	90–100	75–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
95–100	95–100	75–85	0. 20–0. 63	. 20	6. 1–6. 5	High	High.
95–100	95–100	75–85	<0. 06	. 18	5. 6–6. 0	Moderate	High.
95–100	95–100	80–90	<0. 06	. 18	7. 4–7. 8	Moderate	High.
90–100	80–90	25–35	2. 00–6. 30	. 13	5. 6–6. 0	Moderate	Low.
90–100	70–80	40–50	2. 00–6. 30	. 13	5. 1–5. 5	Moderate	Low.
80–90	55–65	0–10	6. 30–20. 00	. 04	6. 1–6. 5	Low	Low.
95–100	80–90	15–25	>20. 00	. 04	5. 1–5. 5	Low	Low.
------	------	------	0. 63–2. 0	. 25	Variable	Low	High.
95–100	85–95	55–65	0. 63–2. 00	. 16	5. 6–6. 0	High	Low.
95–100	85–90	75–85	0. 20–0. 63	. 17	5. 1–5. 5	High	Moderate.
80–90	70–80	60–70	2. 00–6. 30	. 13	6. 6–7. 3	High	Low.
95–100	90–100	85–95	0. 63–2. 00	. 20	5. 1–6. 0	High	Low.
95–100	90–100	80–90	0. 06–0. 20	. 18	5. 1–6. 0	Moderate	Moderate.
95–100	90–100	80–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
95–100	90–100	85–95	0. 63–2. 00	. 20	5. 6–6. 0	High	Low.
95–100	90–100	80–90	0. 06–0. 20	. 18	5. 1–6. 5	Moderate	Moderate.
95–100	90–100	80–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
90–100	75–85	50–60	0. 63–2. 00	. 20	5. 6–6. 0	High	Low.
95–100	80–90	45–55	0. 63–2. 00	. 16	5. 1–5. 5	Moderate	Moderate.
60–70	40–50	20–30	6. 30–20. 00	. 04	5. 6–6. 0	Low	Low.
90–100	75–85	50–60	0. 63–2. 00	. 20	5. 6–6. 0	High	Low.
95–100	80–90	45–55	0. 63–2. 00	. 16	5. 1–5. 5	Moderate	Moderate.
95–100	90–100	85–95	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
90–100	60–70	0–10	>20. 00	. 02	6. 6–7. 3	Low	Low.
95–100	90–100	85–95	0. 63–2. 00	. 23	5. 6–6. 0	High	Moderate.
95–100	90–100	90–80	0. 06–0. 20	. 19	6. 1–6. 5	Moderate	High.
95–100	90–100	80–90	0. 2–0. 63	. 18	7. 4–7. 8	Moderate	High.
95–100	70–80	45–55	2. 00–6. 30	. 15	6. 1–6. 5	Moderate	Low.
95–100	60–75	25–35	2. 00–6. 30	. 13	6. 6–7. 3	Moderate	Low.
95–100	50–60	10–20	6. 30–20. 00	. 04	7. 4–7. 8	Low	Low.
------	------	------	0. 63–2. 00	. 25	5. 1–7. 3	Low	High.
95–100	90–100	80–90	0. 20–0. 63	. 18	5. 6–6. 0	Moderate	Moderate.
95–100	80–90	60–70	0. 63–2. 00	. 15	5. 1–5. 5	High	Low.
90–100	75–85	50–60	0. 63–2. 00	. 16	4. 5–5. 0	Moderate	Moderate.
70–80	50–60	30–40	2. 00–20. 00	. 04	5. 6–6. 0	Low	Low.
95–100	90–100	80–90	0. 63–2. 00	. 23	5. 6–6. 5	Moderate	Low.
95–100	90–100	90–100	0. 06–0. 20	. 19	5. 6–6. 0	Moderate	High.
95–100	90–100	85–95	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
------	------	------	2. 00–6. 30	. 25	7. 4–7. 8	Low	High.
------	------	------	Variable	Variable	7. 9–8. 4	Low	Low.
95–100	80–90	60–75	0. 63–2. 00	. 20	7. 4–7. 8	Moderate	Low.

TABLE 4.—*Estimated engineering*

Soil series and map symbols [2]	Depth to seasonal high water table	Depth from surface	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Maumee: Mm, Mn	[4] 0-1	0-21	Silt loam and loamy fine sand	SM	A-2
		21-60	Fine sand	SM	A-2
Milford:					
Mo, Mr, Mt (For properties of Linwood and Wallkill soils in unit Mt, refer to their respective series.)	[4] 0-1	0-17	Silt loam and silty clay loam	ML or OL	A-4 or A-5
		17-37	Silty clay	CL	A-7
		37-60	Silty clay loam	CL	A-6 or A-7
Ms	[4] 0-1	0-13	Silty clay loam	OH or OL	A-5 or A-7
		13-47	Silty clay or clay loam	CL	A-7
		47-60	Sand and gravel	SM	A-2
Morley: MuB, MuC2, MuD2, MuE, MuB3, MvC3, MvE3.	>4	0-8	Silt loam	CL	A-6
		8-36	Silty clay	CH	A-7
		36-60	Silty clay loam	CL	A-6
Oakville: OaE, OkB (For properties of Tawas soil in OkB, refer to the Tawas series.)	>4	0-80	Fine sand	SP or SP-SM	A-3
Oshtemo: OsA, OsB, OsC	>4	0-7	Fine sandy loam	SM	A-2
		7-28	Sandy loam	SM	A-2
		28-60	Fine sand	SP or SP-SM	A-3
Pewamo:					
Pc	[4] 0-1	0-15	Silty clay loam	CL	A-6
		15-42	Silty clay loam and clay loam	CH	A-7
		42-60	Clay loam	CH	A-7
Pe	[4] 0-1	0-60	Silty clay loam	CH	A-7
Plainfield: PlB, PlC	>4	0-70	Fine sand	SP or SP-SM	A-3
Rensselaer:					
Re	[4] 0-1	0-10	Loam	ML or OL	A-4 or A-6
		10-48	Clay loam and silty clay loam	CL	A-6
		48-60	Stratified silt and sand	SM	A-4
Rn, Rr	[4] 0-1	0-13	Loam	ML or OL	A-4 or A-6
		13-47	Clay loam	CL	A-6
		47-60	Sand and gravel	SM	A-2
Rs	[4] 0-1	0-16	Loam	ML	A-4 or A-6
		16-27	Loam and sandy clay loam	CL	A-6
		27-60	Silty clay loam	CL	A-6
Sparta:					
SpB	>4	0-70	Fine sand	SP or SP-SM	A-3
SrB	>4	0-41	Fine sand	SP	A-3
		41-70	Silty clay loam	CL	A-6 or A-7
Tawas: Ta [5]	[4] 0-1	0-30	Muck	Pt	A-7
		30-60	Fine sand	SM	A-2
Tracy:					
TcA, TcB, TcC	>4	0-15	Loam	ML	A-4
		15-35	Clay loam and sandy clay loam	CL	A-6
		35-60	Sandy loam and loamy sand	SM	A-4
TrB	>4	0-15	Loam	ML	A-4
		15-46	Clay loam or sandy clay loam	CL	A-6
		46-60	Silty clay loam	CL	A-6 or A-7
Tyner: TyB	>4	0-9	Loamy fine sand	SM	A-2
		9-38	Loamy fine sand	SM	A-1 or A-2
		38-70	Medium sand	SP-SM	A-1
Wallkill: Wa [5]	[4] 0-1	0-16	Silt loam	OL or ML	A-4 or A-5
		16-60	Muck	OH	A-7

See footnotes at end of table.

properties of the soils [1]—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
95–100	80–90	20–30	6. 30–20. 00	0. 08	5. 6–6. 0	Low	Low.
95–100	70–80	15–25	>20. 00	. 04	6. 6–7. 4	Low	Low.
95–100	95–100	80–85	0. 20–0. 63	. 20	6. 1–6. 5	High	High.
95–100	90–100	75–85	0. 06–0. 20	. 18	5. 6–6. 0	Moderate	High.
90–100	85–95	70–85	0. 20–0. 63	. 18	5. 6–6. 0	High	High.
95–100	95–100	80–85	0. 20–0. 63	. 20	6. 1–6. 5	High	High.
95–100	90–100	75–85	0. 06–0. 20	. 18	5. 6–6. 0	Moderate	High.
95–100	50–60	10–20	6. 30–20. 00	. 04	7. 4–7. 8	Low	Low.
95–100	90–100	85–95	0. 63–2. 00	. 20	5. 6–6. 0	Moderate	Low.
95–100	90–100	80–90	0. 06–0. 20	. 18	5. 1–5. 5	Moderate	High.
95–100	85–95	75–85	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
90–100	60–70	0–10	>20. 00	. 02	6. 6–7. 3	Low	Low.
85–95	80–90	25–35	2. 00–6. 30	. 13	5. 1–5. 6	Moderate	Low.
80–90	60–70	20–30	2. 00–6. 30	. 13	4. 5–5. 0	Moderate	Low.
75–85	70–80	0–10	6. 30–20. 00	. 04	5. 1–5. 6	Low	Low.
95–100	95–100	80–85	0. 20–0. 63	. 20	6. 1–6. 5	High	Moderate.
95–100	90–100	75–85	0. 06–0. 20	. 18	6. 6–7. 3	Moderate	High.
90–100	85–95	70–85	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	High.
95–100	90–100	75–85	0. 06–0. 20	. 18	7. 4–7. 8	Moderate	High.
95–100	80–90	0–10	>20. 00	. 04	5. 1–5. 5	Low	Low.
95–100	95–100	85–95	0. 63–2. 00	. 20	6. 1–6. 5	Moderate	Moderate.
95–100	80–90	55–65	0. 20–0. 63	. 18	6. 6–7. 8	Moderate	Moderate.
95–100	85–95	35–55	2. 00–6. 30	. 13	6. 6–7. 8	Moderate	Low.
95–100	95–100	85–95	0. 63–2. 00	. 20	6. 6–7. 3	Moderate	Moderate.
90–100	75–85	50–60	0. 20–0. 63	. 18	6. 6–7. 3	Moderate	Moderate.
95–100	50–60	10–20	6. 30–20. 00	. 04	7. 4–7. 8	Low	Low.
95–100	95–100	85–95	0. 63–2. 00	. 20	6. 6–7. 3	Moderate	Moderate.
90–100	75–85	50–60	0. 63–2. 00	. 16	6. 6–7. 8	Moderate	Moderate.
95–100	80–90	55–65	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
95–100	65–75	0–10	>20. 00	. 04	6. 6–7. 3	Low	Low.
95–100	65–75	0–10	>20. 00	. 04	6. 6–7. 3	Low	Low.
90–100	85–95	80–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	High.
			0. 63–2. 00	. 25	6. 1–6. 5	Low	High.
95–100	70–80	15–25	>20. 0	. 04	6. 6–7. 3	Low	Low.
95–100	90–100	70–80	0. 63–2. 00	. 15	5. 6–6. 0	High	Low.
90–100	75–85	50–60	0. 63–2. 00	. 16	4. 5–5. 5	Moderate	Moderate.
85–95	60–70	35–45	2. 00–20. 00	. 08	5. 6–6. 0	Low	Low.
95–100	90–100	70–80	0. 63–2. 00	. 15	5. 6–6. 0	High	Low.
90–100	75–85	50–60	0. 63–2. 00	. 16	4. 5–5. 5	Moderate	Moderate.
95–100	90–100	85–95	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	Moderate.
95–100	50–60	15–25	6. 30–20. 00	. 08	4. 5–5. 0	Low	Low.
90–100	45–55	10–20	6. 30–20. 00	. 08	5. 1–5. 5	Low	Low.
95–100	25–35	5–15	6. 30–20. 00	. 04	5. 6–6. 0	Low	Low.
95–100	90–100	85–95	0. 63–2. 00	. 20	6. 1–6. 5	High	Low.
			0. 63–2. 00	. 25	5. 6–6. 0	Low	High.

TABLE 4.—*Estimated engineering*

Soil series and map symbols [2]	Depth to seasonal high water table	Depth from surface	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Warners: We [5]	[4] 0–1	0–16	Silt loam	ML or OL	A–4 or A–5
		16–60	Marl		
Watseka:					
Wk	1–4	0–12	Loamy fine sand	SM	A–2
		12–60	Fine sand	SM	A–2
Wl	[3] 1–4	0–15	Loamy sand	SM	A–2
		15–35	Fine sand	SM	A–2
		35–60	Silty clay loam	CL	A–6 or A–7
Wauseon: Wo	[4] 0–1	0–16	Fine sandy loam	ML	A–4
		16–34	Loamy fine sand	SM	A–2
		34–60	Silty clay loam	CL	A–7
Whitaker: Wt	1–4	0–10	Loam	CL	A–6
		10–48	Clay loam and sandy clay loam	CL	A–6
		48–60	Silt and sand	ML	A–4

[1] See table 3 and soil descriptions elsewhere in this publication for information about kinds of underlying rock and other detailed information about the soils.
[2] No valid estimates can be made for Borrow pits, Clay pits, Lake beaches, Marsh, and Urban land.
[3] Perched water table.

TABLE 5.—*Interpretations of engi-*

[Interpretations are not given for Borrow pits (Bp), Clay pits (Cp), Lake beaches (Lb),

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil (surface layer)	Sand and gravel	Road subgrade material	Highway location	Agricultural drainage
Alida: Ad, Al	Good	Fair: sand below a depth of 4 feet; no gravel.	Subsoil poor; substratum fair; moderate volume change.	Seasonal high water table; subject to frost heave.	Seasonal high water table; moderate permeability in subsoil; sand below 4 feet may be hazard.
Blount: BlA	Fair: thin	Not suitable	Poor: moderate volume change; medium to high compressibility.	Seasonal perched water table; highly plastic throughout; subject to frost heave.	Seasonal perched water table; slow permeability.
Bono: Bn	Poor: high clay content.	Not suitable	Very poor: high volume change and compressibility.	High water table; highly plastic throughout; unstable and slippery when wet.	Very slow permeability; high water table; special precautions necessary.
Brady: Br	Fair: droughty; soil blowing.	Good: sand below a depth of 3 feet; minor amounts of gravel.	Fair: fair stability and compaction.	Seasonal high water table; low shrink-swell potential.	Seasonal high water table; sandy material requires special attention.
Brems: BsB	Poor: droughty; soil blowing.	Sand good; no gravel.	Good	Low shrink-swell and frost-heave potentials; loose sand easily excavated but hinders hauling.	Moderately well drained

properties of the soils [1]—Continued

Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH value*		
95–100	90–100	55–65	0. 63–2. 00	. 20	6. 6–7. 8	High	Low.
----------	----------	----------	0. 06–10. 20	Variable	7. 9–8. 4	Low	Low.
95–100	80–90	20–30	6. 30–20. 00	. 08	6. 1–6. 5	Low	Low.
95–100	70–80	15–25	6. 30–20. 00	. 04	6. 6–7. 3	Low	Low.
95–100	80–90	20–30	6. 30–20. 00	. 08	6. 6–7. 3	Low	Low.
95–100	70–80	15–25	6. 30–20. 00	. 04	6. 6–7. 3	Low	Low.
90–100	85–95	80–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	High.
95–100	90–100	60–70	2. 00–6. 30	. 13	6. 6–7. 3	Moderate	Low.
90–100	80–90	20–30	0. 63–20. 0	. 04	6. 6–7. 3	Low	Low.
90–100	85–95	80–90	0. 20–0. 63	. 18	7. 4–7. 8	Moderate	High.
95–100	95–100	85–95	0. 63–2. 00	. 18	6. 1–6. 5	Moderate	Low.
95–100	95–100	50–60	0. 20–0. 63	. 18	6. 1–6. 5	Low	Moderate.
80–90	70–80	60–70	2. 00–6. 30	. 13	7. 4–7. 8	Low	Low.

[4] Ponded.
[5] Some estimates are not given for horizons that are mainly organic material or that are marl material composed of calcareous deposits of lakes in which the percentage of calcium carbonate may range from 90 to less than 30 percent.

neering properties of the soils

Marsh (Mh), and Urban land (Ur), because these land types have such variable properties]

Soil features affecting—Continued			Soil limitations for—	
Farm pond reservoir areas	Pond embankments, dikes, and levees	Grassed waterways	Foundations for low buildings	Septic tank disposal fields
Rapid permeability in substratum; some areas suitable for pit-type ponds.	Fair stability and compaction; rapid seepage in substratum.	Soil features favorable; nearly level.	Moderate: seasonal high water table; subsoil difficult to compact when wet; moderate shrink-swell potential.	Moderate: seasonal water table; moderate permeability in subsoil.
Seasonal high water table; slow seepage; level; some areas suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Soil features favorable; seasonal high water table.	Moderate: seasonal high water table; moderate shrink-swell potential.	Severe: seasonal high water table; slow permeability.
High water table; slow seepage; suitable for pit-type ponds.	Fair to poor stability and compaction; high compressibility; good resistance to piping.	Clayey subsoil and high water table make construction difficult; level, depressional.	Severe: high water table; high shrink-swell potential and compressibility; hard when dry.	Very severe: high water table; very slowly permeable throughout.
Rapid permeability in substratum; some areas suitable for pit-type ponds.	Fair stability and compaction; rapid seepage in substratum.	Soil features favorable	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Rapid seepage; too sandy and porous to hold water under natural conditions.	Rapid seepage; fair stability and compaction; low compressibility.	Sandy; slow runoff; difficult to vegetate; erodes easily.	Slight	Slight.

TABLE 5. *Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil (surface layer)	Sand and gravel	Road subgrade material	Highway location	Agricultural drainage
Carlisle: Ca	Poor: erodible; oxidizes rapidly.	Not suitable	Very poor: unstable; very high compressibility.	Unstable: depressional; high water table.	Subsidence of organic material; high water table; poor availability of outlets; control drainage needed.
Darroch: Da	Good	Not suitable	Fair: fair stability and compaction.	Seasonal high water table; subject to frost heave; difficult to compact when wet; high silt content in underlying material.	Moderately slow permeability; high water table.
Del Rey:					
De	Good	Not suitable	Poor: moderate volume change; medium to high compressibility.	Seasonal perched water table hinders construction in some areas; high silt content in underlying material.	Slow permeability; seasonal high water table; wet in depressions.
Dl	Good	Not suitable	Poor: moderate volume change; medium to high compressibility.	Seasonal perched water table hinders construction in some areas; high silt content in underlying material.	Slow permeability; seasonal high water table; wet in depressions.
Door:					
DoA, DoB	Good	Good: sand below a depth of 4 feet; contains shale fragments; no gravel.	Good	Rapid permeability in substratum; cuts and fills generally needed.	Well drained
DrB	Good	Not suitable	Fair: moderate volume change; medium to high compressibility.	Plastic; underlying material unstable; slippery when wet; high volume change.	Well drained
Dune land: Du	Poor: droughty; soil blowing.	Good for sand; no gravel.	Good	Low shrink-swell and frost-heave potentials; loose sand easily excavated but hinders hauling.	Excessively drained
Elliott: El	Good	Not suitable	Poor: medium to high volume change and compressibility.	Seasonal perched water table; highly plastic throughout; subject to frost heave.	Seasonal perched water table; slow permeability.
Gilford: Gd, Gf, Gm	Fair: high water table; droughty; erodible.	Good for sand; poorly graded sand and small amounts of gravel.	Fair: fair stability; high water table.	High water table; wet conditions hinder construction.	High water table; moderately rapid permeability in subsoil, and rapid below; sandy substratum requires special attention.
Linwood: Lm	Poor: erodible; oxidizes rapidly.	Not suitable	Very poor: unstable; very high compressibility.	Unstable; depressional; high water table.	Subsidence of organic material; high water table; poor availability of outlets; control of drainage necessary.

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Farm pond reservoir areas	Pond embankments, dikes, and levees	Grassed waterways	Foundations for low buildings	Septic tank disposal fields
High water table; rapid seepage; some areas suitable for pit-type ponds.	Highly pervious; poor stability and compaction; high water table.	High water table; depressional.	Severe: unstable; very high compressibility; high water table.	Severe: high water table; depressional.
Seasonal high water table; moderately rapid permeability in substratum; some areas suitable for pit-type ponds.	Fair stability and compaction; silt and sand below 4 feet.	Soil features favorable	Moderate: seasonal high water table; low to moderate shrink-swell potential; difficult to compact when wet.	Moderate: seasonal high water table; moderately slow permeability.
Seasonal high water table; medium to slow seepage; rapidly permeable sand lenses in underlying material.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Soil features favorable; seasonal high water table.	Moderate to severe: seasonal high water table; moderate shrink-swell potential.	Severe: seasonal high water table; slow permeability; onsite investigation needed.
Seasonal high water table; medium to slow seepage; rapidly permeable sand lenses in underlying material.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Soil features favorable; seasonal high water table.	Moderate to severe: seasonal high water table; moderate shrink-swell potential.	Severe: seasonal high water table; slow permeability; onsite investigation needed.
Sandy substratum too porous to hold water; rapid seepage.	Fair stability; fair to good compaction; low compressibility.	Soil features favorable; more sloping areas subject to erosion.	Slight	Slight: moderate permeability in subsoil.
Sand lenses in subsoil; moderate seepage.	Fair to good stability and compaction; medium to high compressibility.	Soil features favorable; may be seepage on side slopes.	Slight	Slight: moderate permeability.
Very rapid seepage; too sandy and porous to hold water under natural conditions.	Highly pervious; fair stability and compaction; very low compressibility.	Sandy; slow runoff; difficult to vegetate; erodes easily.	Slight	Slight.
Slow seepage; level; seasonal high water table; some areas suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Soil features favorable; seasonal high water table.	Moderate to severe: seasonal perched water table; moderate to high shrink-swell potential.	Severe: seasonal high water table; slow permeability.
High water table; suitable for pit-type ponds; rapid seepage in substratum.	Subsoil: fair to poor stability and compaction. Substratum: fair stability; very low compressibility; rapid seepage.	Nearly level, depressional.	Moderate: high water table.	Severe: high water table and ponding.
High water table; slow seepage below a depth of 3 feet; suitable for pit-type ponds.	Poor stability and compaction; very high compressibility.	High water table; depressional.	Severe: unstable; very high compressibility; high water table.	Severe: high water table; depressional.

410-618—72——5

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of —			Soil features affecting —	
	Topsoil (surface layer)	Sand and gravel	Road subgrade material	Highway location	Agricultural drainage
Lydick: LyA, LyB	Good	Good: sand below a depth of 4 feet; contains shale fragments; no gravel.	Good	Rapid permeability in substratum; cuts and fills generally needed.	Well drained.
Markham: MaB2	Good	Not suitable	Poor: moderate to high volume change; medium to high compressibility.	Highly plastic throughout; subject to frost heave.	Moderately well drained; small wet areas generally need drainage.
Marl beds: Mb	Poor: erodible; oxidizes rapidly.	Not suitable. (Potential source of marl.)	Very poor: unstable, very high compressibility.	Unstable; depressional; high water table; organic material and marl must be removed.	High water table; poor availability of outlets; slow permeability in marl.
Maumee: Mm, Mn	Fair: high water table; droughty; soil blowing.	Good for sand; minor amounts of gravel.	Fair: fair stability and compaction.	High water table; sandy material loses stability; flows when wet.	High water table; rapid permeability; sandy material requires special attention; ditchbanks unstable.
Milford:					
Mo, Mr, Mt (For interpretations of Linwood soil and Wallkill soil in unit Mt, refer to their respective series.	Good or fair: high clay content.	Not suitable	Poor: high volume change; medium to high compressibility.	High water table; highly plastic throughout; subject to frost heave; difficult to compact when wet.	High water table; slow permeability; depressional.
Ms	Fair: high clay content.	Good: sand below a depth of 3 feet; minor amounts of gravel.	Poor: high volume change; medium to high compressibility.	High water table; highly plastic subsoil; subject to frost heave; difficult to compact when wet.	High water table; depressional; slow permeability.
Morley: MuB, MuC2, MuD2, MuE, MvB3, MvC3, MvE3.	Fair: thin	Not suitable	Poor: moderate to high volume change.	Highly plastic throughout; difficult to work; compact when wet; cuts and fills generally needed.	Moderately well drained to well drained; small wet areas generally need drainage.
Oakville: OaE, OkB (For interpretations of Tawas soil in mapping unit OkB, refer to the Tawas series.)	Poor: droughty; soil blowing.	Good for sand; no gravel.	Good	Low shrink-swell and frost-heave potentials; loose sand easily excavated but hinders hauling.	Excessively drained
Oshtemo: OsA, OsB, OsC	Fair: low available moisture capacity; erodible.	Good: sand below a depth of 3 feet; minor amounts of gravel.	Good	Suitable material; low shrink-swell potential.	Well drained

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Farm pond reservoir areas	Pond embankments, dikes, and levees	Grassed waterways	Foundations for low buildings	Septic tank disposal fields
Sandy substratum too porous to hold water; rapid seepage.	Fair stability; fair to good compaction; low compressibility.	Soil features favorable; sloping areas subject to erosion.	Slight	Slight: moderate permeability in subsoil.
Suitable material: slow seepage.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Clayey subsoil exposed in some areas; difficult to establish and maintain vegetation; erodible.	Moderate: moderate to high shrink-swell potential.	Severe: Slow and moderately slow permeability; large filter beds necessary; onsite investigation needed.
Slow permeability in marl; high water table; suitable for pit-type ponds.	Poor stability and compaction; high water table.	High water table; level, depressional.	Severe: unstable; very high compressibility; high water table.	Severe: high water table; depressional; unstable; slow permeability.
High water table; rapid seepage; suitable for pit-type ponds.	Fair stability and compaction; very low compressibility.	Nearly level, depressional.	Moderate: high water table.	Severe: high water table and ponding; depressional.
Slow seepage; high water table; suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility.	Level, depressional	Severe: high water table; high shrink-swell potential; unstable when wet.	Severe; high water table and ponding; slow permeability.
High water table; rapid permeability in substratum; suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility.	Level, depressional	Severe: high shrink-swell potential; unstable when wet.	Severe: high water table and ponding; slow permeability.
Suitable material: slow seepage.	Fair to good stability and compaction; medium to high compressibility; good resistance to piping.	Clayey subsoil exposed in some areas; difficult to establish and maintain vegetation; erodible.	Moderate to severe: moderate to high shrink-swell potential.	Severe: moderately slow to slow permeability; large filter beds necessary; onsite investigation needed.
Very rapid seepage; too sandy and porous to hold water under natural conditions.	Highly pervious; fair stability and compaction; very low compressibility.	Sandy; slow runoff; difficult to vegetate; erodes easily.	Slight	Slight.
Sandy substratum; porous rapid seepage.	Fair stability and compaction; low compressibility.	Porous; difficult to establish and maintain vegetation; erodible.	Slight	Slight.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil (surface layer)	Sand and gravel	Road subgrade material	Highway location	Agricultural drainage
Pewamo:					
Pc	Good or fair: high clay content.	Not suitable	Poor: moderate to high volume change, unstable when wet.	High water table; highly plastic throughout; subject to frost heave; difficult to compact when wet.	High water table; slow to moderately slow permeability; depressional.
Pe	Fair: high clay content.	Not suitable	Poor: high volume change, unstable when wet.	High water table; highly plastic throughout; subject to frost heave; difficult to compact when wet.	High water table; slow to moderately slow permeability; depressional.
Plainfield: PlB, PlC	Poor: droughty; erodible.	Good for sand; no gravel.	Good	Low shrink-swell and frost-heave potentials; loose sand easily excavated but hinders hauling.	Excessively drained
Rensselaer:					
Re	Fair: high water table.	Not suitable	Fair to poor: moderate volume change.	High water table; plastic subsoil; moderate amounts of silt below 4 feet.	High water table; moderately slow permeability; depressional; silt and sand below 4 feet needs special attention.
Rn, Rr	Fair: high water table.	Sand: good below a depth of 4 feet; minor amounts of gravel.	Fair to poor: moderate volume change.	High water table; plastic subsoil.	High water table; moderately slow permeability; depressional; sand below 4 feet needs special attention.
Rs	Fair: high water table.	Not suitable	Fair to poor: moderate volume change.	High water table; plastic; difficult to compact when wet.	High water table; moderately slow permeability; depressional.
Sparta:					
SpB	Poor: very low available moisture capacity; erodible.	Good for sand; no gravel.	Good	Low shrink-swell and frost-heave potentials; loose sand easily excavated but hinders hauling.	Moderately well drained
SrB	Poor: very low available moisture capacity; erodible.	Not suitable	Subsoil good: substratum poor; high volume change and compressibility.	Plastic underlying material; unstable; slippery when wet; high volume change.	Moderately well drained; lateral seepage on slopes.
Tawas: Ta	Poor; erodible; oxidizes rapidly.	Fair: sand below muck, variable; no gravel.	Very poor: unstable; very high compressibility.	Unstable; organic material; depressional; high water table.	Subsidence of organic material; poor availability of outlets; rapid permeability in sand; requires special attention.
Tracy:					
TcA, TcB, TcC	Good	Good: sand below a depth of 4 feet; contains shale fragments; no gravel.	Good	Rapid permeability in substratum; cuts and fills generally needed.	Well drained

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Farm pond reservoir areas	Pond embankments, dikes, and levees	Grassed waterways	Foundations for low buildings	Septic tank disposal fields
Slow seepage; high water table; suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility.	Level, depressional	Severe: high water table; moderate to high shrink-swell potential; unstable when wet.	Severe: high water table and ponding; slow to moderately slow permeability.
Slow seepage; high water table; suitable for pit-type ponds.	Fair to poor stability and compaction; high compressibility.	Level, depressional	Severe: high water table; high shrink-swell potential; unstable when wet.	Severe: high water table and ponding; slow to moderately slow permeability.
Rapid seepage; too sandy and porous to hold water under natural conditions.	Rapid seepage; fair stability and compaction; very low compressibility; fair resistance to piping.	Sandy; slow runoff; difficult to vegetate; erodes easily.	Slight	Slight.
Moderately rapid permeability in substratum; some areas suitable for pit-type ponds.	Subsoil: fair to good stability and compaction; slow seepage. Substratum: fair stability and compaction; moderately rapid seepage.	Soil features favorable; level, depressional.	Moderate: high water table; moderate shrink-swell potential.	Severe: high water table and ponding; moderately slow permeability.
Rapid permeability in substratum; some areas suitable for pit-type ponds.	Subsoil: fair to good stability and compaction; moderately slow seepage. Substratum: fair stability and compaction; rapid seepage.	Soil features favorable; level, depressional.	Moderate: high water table; moderate shrink-swell potential.	Severe: high water table and ponding; moderately slow prmeability in subsoil.
High water table; slow seepage; suitable for pit-type ponds.	Fair to good stability and compaction; medium to high compressibility.	Soil features favorable; level, depressional.	Moderate: high water table; moderate shrink-swell potential.	Severe: high water table and ponding; moderately slow permeability.
Sandy material too porous to hold water; rapid seepage.	Fair stability and compaction; very low compressibility; fair resistance to piping.	Porous sand; little runoff; difficult to vegetate.	Slight	Slight.
Rapid seepage in uppermost 3 feet.	Clayey substratum has high compressibility; fair to good stability and compaction.	May be seepage on side slopes.	Moderate: clayey substratum has high volume change and compressibility.	Severe: slow permeability in substratum; onsite investigation needed.
High water table; pervious; suitable for pit-type ponds.	Organic material has poor stability and compaction; sand has fair stability and compaction.	High water table; depressional.	Severe: unstable organic material; very high compressibility; high water table.	Severe: high water table and ponding; depressional.
Sandy substratum; too porous to hold water; rapid seepage.	Fair stability; fair to good compaction; low compressibility.	Soil features favorable; more sloping areas are subject to erosion.	Slight	Slight: moderate permeability in subsoil.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil (surface layer)	Sand and gravel	Road subgrade material	Highway location	Agricultural drainage
Tracy—Continued					
TrB	Good	Not suitable	Fair: moderate volume change; medium to high compressibility.	Plastic underlying material; unstable; slippery when wet; moderate volume change.	Well drained
Tyner: TyB	Poor: droughty; soil blowing.	Good: no gravel.	Good	Low shrink-swell and frost-heave potentials; lacks stability under wheel loads except when damp.	Well drained
Wallkill: Wa	Fair: high water table.	Not suitable	Poor: unstable; very high compressibility.	High water table; unstable organic material; depressional.	Subsidence of organic material; poor availability of outlets.
Warners: We	Fair: high water table.	Not suitable. (Potential source of marl.)	Very poor: unstable; very high compressibility.	High water table; unstable; depressional; marl must be removed.	High water table; poor availability of outlets; slow permeability in marl.
Watseka:					
Wk	Poor: droughty; soil blowing.	Good for sand; no gravel.	Fair: fair stability and compaction.	Seasonal high water table; sandy material loses stability; flows when wet.	Rapid permeability; sandy material requires special attention; unstable ditchbanks.
Wl	Poor: droughty; soil blowing.	Not suitable	Poor: fair to poor stability and compaction.	Seasonal perched water table; plastic, unstable at a depth of about 3 feet; difficult to work.	Moderately slowly permeable; silty clay loam at a depth of about 3 feet.
Wauseon: Wo	Fair: droughty; soil blowing.	Not suitable	Poor: fair to poor stability and compaction.	High water table; plastic, unstable at a depth of about 3 feet; difficult to work.	Moderately slowly permeable; silty clay loam at a depth of about 3 feet.
Whitaker: Wt	Good	Not suitable	Fair: moderate volume change.	Seasonal high water table; difficult to compact when wet; high silt content in underlying material.	Seasonal high water table; moderately slow permeability.

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Farm pond reservoir areas	Pond embankments, dikes, and levees	Grassed waterways	Foundations for low buildings	Septic tank disposal fields
Sand lenses in subsoil; moderate seepage.	Fair to good stability and compaction; medium to high compressibility.	Soil features favorable; may be seepage on side slopes.	Slight	Slight: moderate permeability.
Sandy; porous; rapid seepage.	Pervious; poor to fair stability and compaction; low compressibility.	Sandy; porous; difficult to establish vegetation; erodible.	Slight	Slight.
High water table; rapid seepage; suitable for pit-type ponds.	Highly pervious; poor stability and compaction.	High water table; depressional.	Severe: unstable organic material; very high compressibility; high water table.	Severe: high water table; depressional; unstable.
Slow permeability in marl; high water table; suitable for pit-type ponds.	Poor stability and compaction; very high compressibility.	Level, depressional	Severe: unstable; very high compressibility; high water table.	Severe: high water table; depressional; unstable; slow permeability.
Rapid seepage; some areas suitable for pit-type ponds.	Fair stability and compaction; very low compressibility.	Nearly level, depressional.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Seasonal high water table; rapid seepage in uppermost 3 feet.	Fair to poor stability and compaction; silty clay loam material has high compressibility.	Subject to soil blowing; sandy surface dries out quickly.	Severe: seasonal perched water table; high volume change; high compressibility.	Severe: seasonal perched water table; moderately slowly permeable; onsite investigation needed.
High water table; rapid seepage in uppermost 3 feet; suitable for pit-type ponds.	Fair to poor stability and compaction; silty clay loam material has high compressibility.	Nearly level, depressional.	Severe: high water table; high shrink-swell potential; high compressibility.	Severe: high water table; moderately slowly permeable; onsite investigation needed.
Seasonal high water table; moderate seepage in substratum; some areas suitable for pit-type ponds.	Fair stability and compaction; silt and sand below a depth of 4 feet.	Soil features favorable	Moderate to severe: seasonal high water table; high silt content in substratum.	Moderate to severe: seasonal high water table; moderately slow permeability.

Town and Country Planning [5]

This section provides information about soil limitations that affect the selection of soils for town and country planning. This information will help planners in evaluating the suitability of soils as sites for homes, industrial developments, schools, and parks. The soils are rated according to limitations caused by bearing capacity, percolation rate, slope, and wetness resulting from a seasonal high water table. The ratings in table 6 express the degree of limitation as "slight," "moderate," or "severe."

[5] KENNETH A. WENNER, county extension agent in soils, Purdue University, assisted in the writing of this section.

Bearing capacity is the ability of a soil to adequately support structures. The ratings in table 6 specifically apply to the limitations of soils in the county if used to support foundations of buildings up to three stories high. These ratings are estimates based on the data given in table 4 for the engineering properties of the soils. No specific value should be assigned to the rating.

Percolation rate is a measurement of the movement of water through the soil profile and is expressed in minutes per inch of soil. The ratings of limitations caused by percolation rate given in table 6 are based on measurement in actual tests on some of the soils in Lake County and on interpolation of tests on similar soils that do not

TABLE 6.—*Degree of limitation for town and country planning*

[No evaluation is given for Borrow pits, Clay pits, Urban land, and Oakville-Tawas complex, 0 to 6 percent slopes, because the properties of these mapping units are so variable. Absence of a rating for a property indicates that the property is too variable for a rating]

Soil series and map series	Bearing capacity	Percolation rate	Slope	Seasonal high water table
Alida: Ad, Al	Moderate	Moderate	Slight	Moderate.
Blount: BlA	Moderate	Severe	Slight	Moderate.
Bono: Bn	Moderate	Severe	Slight	Severe.
Brady: Br	Moderate	Slight	Slight	Moderate.
Brems: BsB	Slight	Slight	Slight	Moderate.
Carlisle: Ca	Severe	Slight	Slight	Severe.
Darroch: Da	Moderate	Moderate	Slight	Moderate.
Del Ray: De, Dl	Moderate	Severe	Slight	Moderate.
Door loam: DoA, DoB, DrB	Moderate	Moderate	Slight	Slight.
Dune land: Du	Moderate	Slight	Severe	Slight.
Elliott: El	Moderate	Severe	Slight	Moderate.
Gilford: Gd, Gf, Gm	Moderate	Slight	Slight	Severe.
Lake beaches: Lb			Slight	
Linwood: Lm	Severe	Moderate	Slight	Severe.
Lydick: LyA, LyB	Moderate	Moderate	Slight	Slight.
Markham: MaB2	Moderate	Severe	Slight	Slight.
Marl beds: Mb	Severe	Severe	Slight	Severe.
Marsh: Mh			Slight	Severe.
Maumee: Mm, Mn	Moderate	Slight	Slight	Severe.
Milford:				
Mo, Mr, Ms	Moderate	Severe	Slight	Severe.
Mt			Slight	Severe.
Morley:				
MuB, MvB3	Moderate	Severe	Slight	Slight.
MuC2, MvC3	Moderate	Severe	Moderate	Slight.
MuD2, MuE, MvE3	Moderate	Severe	Severe	Slight.
Oakville: OaE	Slight	Slight	Severe	Slight.
Oshtemo:				
OsA, OsB	Moderate	Slight	Slight	Slight.
OsC	Moderate	Slight	Moderate	Slight.
Pewamo: Pc, Pe	Moderate	Severe	Slight	Severe.
Plainfield:				
PlB	Slight	Slight	Slight	Slight.
PlC	Slight	Slight	Moderate	Slight.
Rensselaer: Re, Rn, Rr, Rs	Moderate	Moderate	Slight	Severe.
Sparta:				
SpB	Slight	Slight	Slight	Slight.
SrB	Moderate	Moderate	Slight	Slight.
Tawas: Ta	Severe	Slight	Slight	Severe.
Tracy: TcA, TcB, TcC, TrB	Moderate	Moderate	Slight	Slight.
Tyner: TyB	Slight	Slight	Slight	Slight.
Wallkill: Wa	Severe	Slight	Slight	Severe.
Warners: We	Severe	Severe	Slight	Severe.
Watseka:				
Wk	Moderate	Slight	Slight	Moderate.
Wl	Moderate	Moderate	Slight	Moderate.
Wauseon: Wo	Moderate	Moderate	Slight	Severe.
Whitaker: Wt	Moderate	Moderate	Slight	Moderate.

have a high water table. The limitation is "slight" if the percolation rate per inch of soil is faster than 45 minutes, is "moderate" if from 45 to 75 minutes, and is "severe" if slower than 75 minutes.

Slope of a soil, normally expressed in percentage, is the difference in elevation in feet for each 100 feet of horizontal distance. These percentages help in estimating the limitation of a soil for various uses. The limitation is rated "slight" for soils that have slopes of 0 to 6 percent, "moderate" for soils that have slopes of 6 to 12 percent, and "severe" for soils that have slopes of more than 12 percent.

A seasonal high water table is the highest level that the water table reaches during a year. Limitation to use of soils for town and country development is "slight" if the seasonal high water table is at a depth of more than 4 feet, "moderate" if from 1 to 4 feet, and "severe" if from 0 to 1 foot.

More detailed information concerning limitations of soils for use as foundations of low buildings or as septic tank disposal fields is given in table 5.

Use of the Soils As Woodland [6]

Originally, only a small acreage of Lake County was covered with hardwood trees of good quality. The native vegetation on the extensive prairie consisted of a large transitional belt of grass and dwarfed hardwoods of the savanna type. The hardwoods now grow largely along the major streams and tributaries (fig. 18). The 1959 Conservation Needs Inventory reported only 18,200 acres of woodland, or 5 percent of the acreage of the county. The inventory estimates that, by 1975, the area in trees will be reduced to approximately 16,400 acres.

The recent decrease in woodland has been largely caused by town and country development. The demand for homesites, industrial sites, recreational areas, and roadways is expected to continue and further reduce woodland in the county. The wooded areas purchased for building sites generally have sold for more than have open fields. Because of this higher price, it is desirable

[6] JOHN O. HOLWAGER, woodland conservationist, Soil Conservation Service, assisted in the writing of this section.

Figure 18.—Hardwood stands in the county grow dominantly on the steep Morley soils along streams and tributaries.

410 618—72——6

to keep wooded areas in trees until development for other use is feasible.

Discussed in the following paragraphs is the woodland in the four soil associations that contain most of the wooded areas in the county. These soil associations are described in more detail in the section "General Soil Map" and are shown on the map at the back of this survey.

In the Oakville-Tawas and the Plainfield-Watseka associations, most of the trees grow on the Oakville and the Plainfield soils. These soils occur on sandy ridges and are excessively drained. They have very low available moisture capacity and very rapid permeability.

The trees that grow commonly in these areas are black oak, white oak, various hickories, and black cherry. They also grow in some areas of the Tyner soils in the southern part of the county.

The trees in these two associations generally are of poor quality and are of more value as windbreaks and cover for wildlife than they are as wood crops.

The soils in the Maumee-Bono-Warners association occur in the depressional and nearly level areas of the lake plains and are very poorly drained. The water table in these soils is at or near the surface at some time during the year.

The trees that commonly grow in these areas are pin oak, soft maple, and aspen. They also grow in wet, depressional areas of other soil associations.

The Morley-Blount-Pewamo association has the largest wooded areas in the county. In this association trees grow mostly on the moderately sloping to steep Morley soils. These soils are on narrow breaks along the valleys and on small knolls and ridges in broader areas that are dissected by small drainageways and streams. The soils in this association are moderately well drained. Permeability is slow, and available moisture capacity is high.

The trees that commonly grow in these areas are bur oak, red oak, black oak, white oak, sugar maple, and white ash. They are of the best quality in the county.

Because of the rapid use of the soils in Lake County for town and country developments, it generally is believed that there should be little or no tree planting for long term production. Plantings in small areas are needed for controlling erosion, developing farm and homestead windbreaks, landscaping building sites, establishing areas for wildlife food and cover, and beautifying rural areas.

Landscaping

This section gives information about some of the shrubs, vines, and other ground cover used in landscaping sites for homes, schools, industry, and recreational areas. In planning, consideration should be given to wind protection, screening of unsightly areas, and the general beauty of neighborhoods.

Trees and shrubs of different species vary widely in suitability to different soils and to site conditions. The soils in the county are placed in four shrub groups mainly on the basis of the amount of wetness from a seasonal high water table and from the available moisture capacity.

Each of the soils in a specific group has similar suitability for trees, vines, and shrub plantings. The soils in a shrub suitability group can be identified by referring to the "Guide to Mapping Units" at the back of this survey. No shrub suitability group has been assigned to Borrow pits, Clay pits, Lake beaches, the Oakville-Tawas complex or Urban land.

Table 7 lists suitable uses for specified plants on soils in the four shrub groupings. The plants listed in the table are only a partial list of the plants suited to soils in the county. Many of the plants serve a dual purpose of landscaping and of providing food and cover for wildlife. If more detail is needed and pertinent landscaping plans are desired, landowners and others should communicate with local landscape specialists.

TABLE 7.—*Shrub and ground cover plantings*

[Absence of entry indicates that on the soils in the group the plant is not suitable for any of the specified uses]

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Arborvitae	Ultimate height of 40 to 60 feet; evergreen.	Shelterbelts and windbreaks; hedges.			
Arrowwood	Ultimate height of 10 to 12 feet; slow growing; shade tolerant.	Wildlife borders	Wildlife borders		
Autumn olive	Ultimate height of 8 to 14 feet; shade tolerant.			Wildlife borders; areas around ponds.	
Blackberry	Ultimate height of 4 to 6 feet; thorny; fruit producers.		Wildlife borders	Wildlife borders	

TABLE 7.—*Shrub and ground cover plantings*—Continued

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Blackhaw	Ultimate height of 15 to 20 feet; slow growing; shade tolerant.			Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Cherry, Manchu	Ultimate height of 3 to 6 feet; shade tolerant; grows only where plant competition is slight.			Wildlife borders	Wildlife borders.
Coralberry	Ultimate height of 4 to 6 feet; shade tolerant; may spread into unclipped and nontilled areas.	Wildlife borders; gullies and road cuts.	Wildlife borders; gullies and road cuts.	Wildlife borders; gullies and road cuts.	
Crabapple, Siberian	Ultimate height of 15 to 20 feet; shade tolerant.	Wildlife borders; areas around ponds.		Wildlife borders; areas around ponds.	
Cranberry, highbush	Ultimate height of 6 to 12 feet; slow growing; shade tolerant.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	
Currant	Ultimate height of 2 to 4 feet.			Wildlife borders	
Dogwood:					
Gray	Ultimate height of 4 to 8 feet; slow growing.	Wildlife borders	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	
Red-osier	Ultimate height of 8 to 12 feet; shade tolerant.	Especially well suited to streambanks; good border plant.	Especially well suited to streambanks.	Especially well suited to streambanks.	
Roughleaf	Ultimate height of 8 to 12 feet.			Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Silky	Ultimate height of 6 to 12 feet; shade tolerant; especially well suited to soils that are not artificially drained.	Wildlife borders; areas around ponds; streambanks.	Wildlife borders; areas around ponds; streambanks.	Wildlife borders; areas around ponds; streambanks.	
Hazelnut, American	Ultimate height of 8 to 10 feet.			Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Honeysuckle:					
Amur	Ultimate height of 8 to 16 feet; shade tolerant.	Shelterbelts and windbreaks; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	
Tartarian	Ultimate height of 10 to 16 feet; shade tolerant.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	

TABLE 7.—*Shrub and ground cover plantings*—Continued

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Indigobush	Ultimate height of 10 to 15 feet; shade tolerant; good for controlling erosion.				Gullies and road cuts.
Nannyberry	Ultimate height of 6 to 12 feet; slow growing; shade tolerant.	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	
Ninebark	Ultimate height of 6 to 10 feet; shade tolerant; gregarious.				Shelterbelts and windbreaks.
Pine:					
Jack	Ultimate height of 40 to 60 feet; evergreen.	Shelterbelts and windbreaks; areas around ponds; gullies and road cuts.			
Red	Ultimate height of 60 to 80 feet; evergreen.		Shelterbelts and windbreaks; areas around ponds.		
White	Ultimate height of 60 to 80 feet; evergreen.	Shelterbelts and windbreaks; hedges; areas around ponds.	Shelterbelts and windbreaks; hedges; areas around ponds.	Shelterbelts and windbreaks; hedges; areas around ponds.	
Plum, wild	Ultimate height of 10 to 20 feet; very hardy; thorny.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.
Raspberry	Ultimate height of 4 6 feet; thorny.		Wildlife borders; areas around ponds.	Wildlife borders	
Rose:					
Multiflora	Ultimate height of 6 to 10 feet; thorny; may spread into unclipped and nontilled areas.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	
Rugosa	Ultimate height of 4 to 6 feet; thorny.			Gullies and road cuts.	Gullies and road cuts.
Russian-olive	Ultimate height of 10 to 20 feet; shade tolerant; thorny; very hardy.				Shelterbelts and windbreaks.
Spruce, Norway	Ultimate height of 60 to 80 feet; evergreen.	Shelterbelts and windbreaks; hedges; areas around ponds.	Shelterbelts and windbreaks; hedges; areas around ponds.	Shelterbelts and windbreaks; hedges; areas around ponds.	
Sumac:					
Smooth	Ultimate height of 10 to 15 feet.				Wildlife borders.
Staghorn	Ultimate height of 10 to 15 feet; shade tolerant; sprouts persistently from roots.				Wildlife borders.

TABLE 7.—*Shrub and ground cover plantings*—Continued

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Wayfaring-tree	Ultimate height of 6 to 12 feet.	Wildlife borders	Wildlife borders		
Willow, purple-osier	Ultimate height of 6 to 10 feet; will reproduce from cuttings.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; especially well suited to streambanks.	Shelterbelts and windbreaks; especially well suited to streambanks.		

Named in the following paragraphs are properties of the soils in each shrub group that are important to the growth of plants.

Shrub group 1.—All of the soils in this group are poorly drained and very poorly drained. These soils have a high water table and may be ponded at some time during the year. They are nearly level and depressional. All of the organic soils are in group 1.

Shrub group 2.—All of the soils in this group are somewhat poorly drained. These soils have a perched or seasonal high water table and are nearly level.

Shrub group 3.—In this group are moderately well drained and well drained soils that have moderate or high available moisture capacity. The water table normally is below 4 feet. The soils in group 3 are nearly level to steep.

Shrub group 4.—This group consists of moderately well drained to excessively drained soils that have low or very low available moisture capacity. The water table normally is below 4 feet. The soils in group 4 are nearly level to steep.

Use of the Soils for Wildlife[7]

This section discusses the suitability of soils for use as habitat for the wildlife present in the county. Defined are the elements generally essential to suitable habitat for the three major classes of wildlife present. The soils in the county are placed in seven wildlife groups that are based mainly on depth to the water table, that is, whether the water table is perched, ponded, or seasonally fluctuating, and on capacity of the soils to supply adequate moisture for those plants that provide food and cover for wildlife. Table 8 rates each wildlife group on suitability for providing the various elements generally essential to the habitat and on the potential of the soils in the group to support the specified classes of wildlife.

In table 8, each wildlife group is given a rating of "well suited," "suited," "poorly suited," or "unsuited," respectively, for each of eight habitat elements. For details of suitability and limitation of a specific soil, the reader should refer to the section "Descriptions of the Soils" elsewhere in this survey. The elements for which the groups are rated in table 8 are defined in the following paragraphs.

Grain and seed crops.—These crops are corn, sorghum, millet, soybeans, buckwheat, wheat, oats, barley, rye, and other grains or grainlike seeds that are important to survival and continued support of the specified wildlife.

Grasses and legumes.—In this habitat element are domestic grasses and legumes that are established by planting and that commonly are used for forage. Most valuable of the grasses and legumes used for wildlife food and cover are lespedezas, alfalfa, alsike clover, ladino clover, red clover, tall fescue, bromegrass, bluegrass, and timothy.

Wild herbaceous plants.—In this element are native perennial grasses and other herbaceous plants that commonly grow on the uplands. Among these are panicgrass and other native grasses; partridge peas, beggartick, whitetop aster, goldenrod, ragweed, dandelion, various native lespedezas, and other native herbs.

Hardwood plants.—This element consists of native or planted hardwood trees and shrubs that grow vigorously and bear heavy crops of fruit or seed. Among these are oak, walnut, hickory, wild cherry, sumac, flowering dogwood, hazelnut, shrub lespedezas, multiflora rose, autumn olive, and bush honeysuckle. Among the water-tolerant shrubs and trees that are of value to wildlife are red-osier dogwood, silky dogwood, aspen, pin oak, and soft maple.

Coniferous plants.—The native or planted coniferous trees of this habitat element are red pine, white pine, and Norway spruce. The suitability ratings for this element are based on those limitations to growth that produce dense, low foliage and delayed canopy closure, rather than those that affect production of timber.

Wetland food and cover plants.—Making up this element are wild, herbaceous, annual and perennial plants that grow on moist to wet soils and that provide food and cover for waterfowl and furbearing animals. Such plants are bulrush, barnyardgrass, duckweed, pondweed, pickerelweed, cattails, and various sedges.

For specific shrub and tree species suitable for habitat plantings, refer to table 7 in the section "Landscaping." The shrub suitability group to which a specific soil has

[7] JAMES MCCALL, biologist, Soil Conservation Service, assisted in writing this section.

TABLE 8. —*Suitability of soils for elements*

[Suitability was not determined for Borrow pits, Clay pits, Lake beaches, the

Group, soil and land type, and map symbol	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood plants	Coniferous plants
Group 1: Carlisle: Ca. Marl beds: Mb. Marsh: Mh. Warners: We.	Unsuited	Poorly suited	Unsuited: deep organic deposits and marl.	Well suited	Well suited
Group 2: Gilford: Gd, Gf, Gm. Linwood: Lm. Maumee: Mm, Mn. Tawas: Ta. Wallkill: Wa.	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited
Group 3: Bono: Bn. Milford: Mo, Mr, Ms. Pewamo: Pc, Pe. Rensselaer: Re, Rn. Rr, Rs. Wauseon: Wo.	Poorly suited	Suited	Suited	Well suited	Suited
Group 4: Watseka: Wk, Wl.	Poorly suited	Suited	Suited	Poorly suited	Poorly suited
Group 5: Alida: Ad, Al. Blount: BlA. Brady: Br. Darroch: Da. Del Rey: De, Dl. Elliott: El. Whitaker: Wt.	Suited	Suited	Well suited	Well suited	Poorly suited
Group 6: Door: DoA, DoB, DrB. Lydick: LyA, LyB. Markham: MaB2. Morley: MuB, MuC2, MuD2, MuE, MvB3, MvC3, MvE3. Oshtemo: OsA, OsB, OsC. Tracy: TcA, TcB, TcC, TrB.	Well suited if slope is less than 6 percent; suited to unsuited if more than 6 percent.	Well suited if slope is less than 12 percent; suited if more than 12 percent.	Well suited	Well suited	Poorly suited
Group 7: Brems: BsB. Dune land: Du. Oakville: OaE. Plainfield: PlB, PlC. Sparta: SpB, SrB. Tyner: TyB.	Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited

of wildlife habitat and for kinds of wildlife

Milford-Linwood-Wallkill complex, the Oakville-Tawas complex, or Urban land]

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Poorly suited: deep organic deposits and marl.	Well suited: some difficulty in water control.	Well suited: some difficulty in construction work.	Unsuited	Suited	Suited.
Mostly well suited; suited for shallow organic soils.	Well suited	Well suited	Poorly suited	Well suited	Mostly well suited; suited for shallow organic soils.
Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Suited	Suited	Suited	Suited	Poorly suited	Suited.
Suited	Suited	Suited	Well suited	Suited	Suited.
Unsuited	Unsuited	Unsuited	Well suited if slope is less than 12 percent; suited if more than 12 percent.	Well suited if slope is less than 12 percent; suited if more than 12 percent.	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.

been assigned is listed in the "Guide to Mapping Units" at the back of this survey.

Shallow water developments.—For this element the soils are rated on suitability for the construction of a low dike to impound shallow water that can be controlled so as to maintain a depth generally not to exceed 5 feet.

Excavated ponds.—For this element the soils are rated on their suitability for the construction of excavated ponds or dugout ponds. Excavated ponds must not depend on runoff from surrounding areas, though the ponds may benefit by such runoff if it is not excessive and does not cause excessive silting. Depth of the ponds should be at least 6 feet, and the water level normally should fluctuate in accordance with changes in the level of ground water.

Although impounded farm ponds are not included in this habitat element, excavated ponds also attract resting migratory waterfowl and can be an important support to production of fresh-water fish. The suitability of soils for construction of impounded or embankment-type farm ponds is included in the section "Engineering Uses of the Soils."

The ratings of any particular soil for wildlife uses are based on specific habitat elements considered important to each of the three wildlife classes noted in table 8. The three classes of wildlife are:

Openland wildlife.—In this wildlife class are birds and mammals that normally frequent cropland, pasture, hayland, and other areas overgrown with grasses, herbs, and shrubs. Examples of openland wildlife are quail, meadow lark, rabbit, and red fox.

Woodland wildlife.—The birds and mammals in this wildlife class normally frequent areas densely covered by hardwood trees, coniferous trees, shrubs, or mixtures of these plants. Examples of woodland wildlife are squirrel, raccoon, woodchuck, woodpeckers, nuthatchers, vireos, and several kinds of warblers.

Wetland wildlife.—Birds and mammals that normally frequent wet areas, such as ponds, marshes, and swamps, are in this wildlife class. Examples are muskrat, rail, the kingfisher, and various kinds of waterfowl.

In table 8 the soil suitability ratings for use as habitat for specific kinds of wildlife indicate, in a general way, the places where habitat can be most suitably managed so as to give satisfactory support to the specific kind of

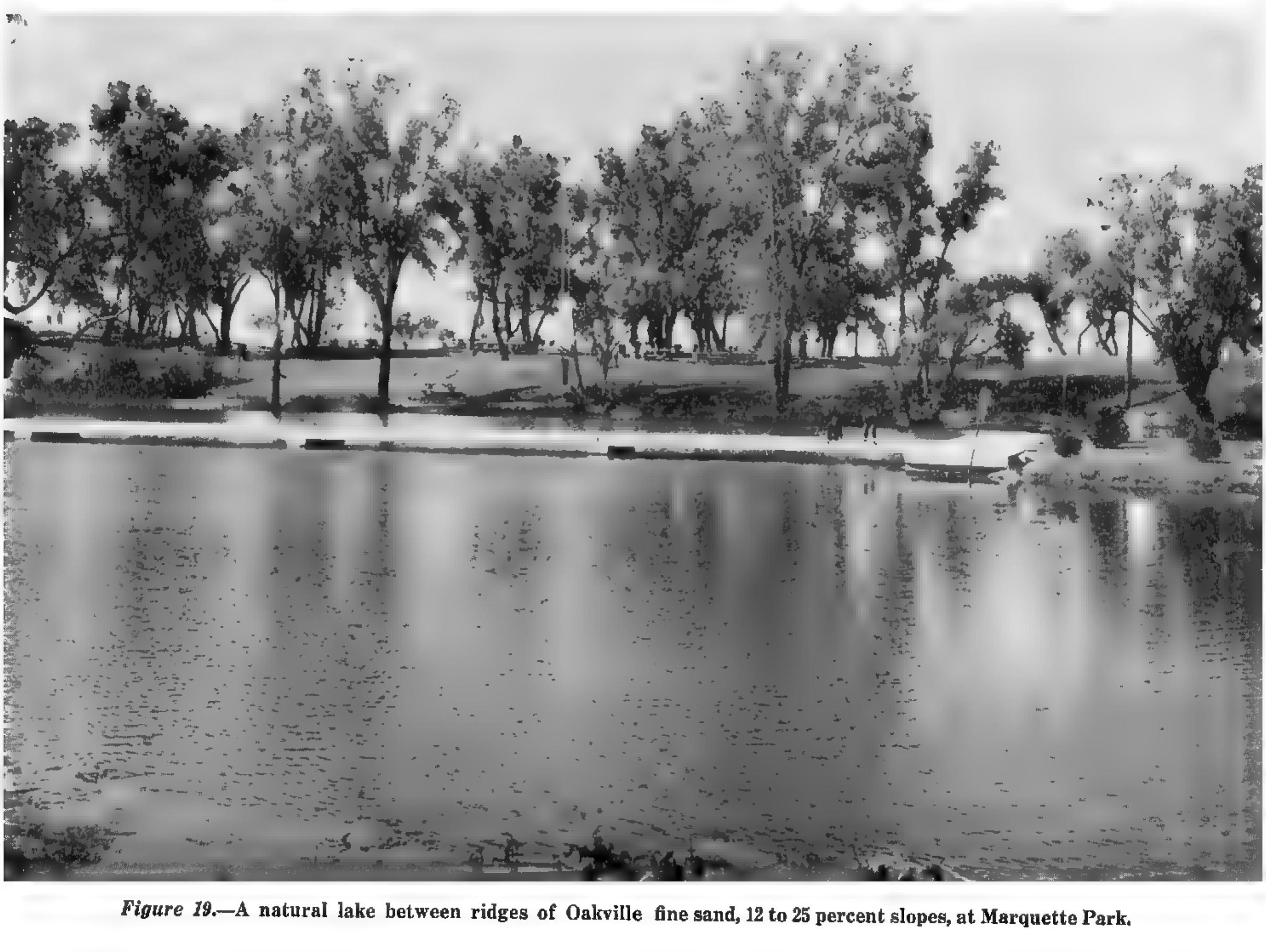

***Figure 19.*—A natural lake between ridges of Oakville fine sand, 12 to 25 percent slopes, at Marquette Park.**

wildlife noted in the column. The ratings also indicate the intensity of habitat management required for support of the wildlife in a given class.

Use of the Soils for Recreation

In this county the competition for land for farms, for highways, and as sites for homes and industrial developments generally leaves only the less desirable tracts for recreational use. The wide range of activity and the seasonal nature of recreation, however, make possible the use of many of these undesirable areas for what is now an important part of American life. The importance of outdoor recreation is accurately appraised by the Outdoor Recreation Resources Review Commission: "Outdoor recreational activity, already a major part of American life, will triple by the year 2,000.... Outdoor recreation should be an integral element in local land use planning" (*3*).

In Lake County the Lake Michigan shoreline is the greatest natural asset. Lake beaches and adjacent Dune land are well suited to use for high density outdoor recreation. The undisturbed landscape of marshes, lakes (fig. 19), and steep, wooded areas behind the Dune land is ideally suitable for recreational developments. The steep, wooded slopes along streams and the depressional areas cut by meandering streams in the central and southern parts of the county are readily suitable for multipurpose recreational or wildlife uses. Some of these areas could most suitably serve as "natural laboratories" for the fields of education and science.

The soils in Lake County have been grouped according to those characteristics that affect development of recreational facilities. There are six groups. Each group consists of soils that have similar potential for development. The factors considered in assigning each soil to a specified group include soil texture, wetness, permeability, slope, and droughtiness.

Table 9 shows the degree and the kind of limitation of each soil in the county for specified recreational uses. The suitability ratings in this table are expressed in degree of limitation. They predict behavior of specific kinds of soils if used for any of the six recreational facilities noted in the table. There are four degrees of limitation. Soils with the rating of "slight" are easily suitable for the designated use. The limitations implied in a rating of "moderate" should be recognized but can be overcome through correct planning, careful designing, and good management. Suitability to use as designated is questionable if the rating is "severe." Careful planning and intensive management are needed. The rating of "very severe" indicates need for extremely intensive management practices so as to overcome the limitations and that use of the soils in the group generally is not practical. These ratings are based on soil properties and do not consider other soil features of probable importance in the selection of a particular area for a particular recreational use. The ratings are intended to serve only as information that is preliminary to further, detailed, onsite investigation.

Formation and Classification of the Soils[8]

This section discusses the effects of the five factors of soil formation on the development of soils in Lake County and tells how important processes affect the formation of horizons in the soil profile. This section also explains the current system of soil classification and classifies the soil series in higher categories of that system. The soil series in the county are described in the section "Descriptions of the Soils."

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on material deposited or accumulated by natural forces. The characteristics of a soil are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks, and they slowly change it to a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing parent material into a soil. The amount of time may be short or long, but some time is required for soil horizons to form. In most places a long time is required for distinct horizons to develop.

The factors of soil genesis are so closely interrelated that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

The parent materials from which soils in Lake County were derived are glacial till and outwash, windblown sand, lacustrine deposits, and organic materials. The kinds of parent material in the county are greatly influenced by the geologic history.

The county is made up of three main physiographic divisions: (1) the plain of former glacial Lake Chicago, (2) part of the Valparaiso morainic system and associated glacial till plains, and (3) the outwash plain and lake plain of the Kankakee Basin. The plain of former glacial Lake Chicago extends southward from Lake Michigan for about 9 miles along the eastern boundary of the county and for more than 13 miles along the western boundary. The part of the Valparaiso morainic system that passes through Lake County forms a belt 14 to 18 miles wide and extends in a general east-west direction across the central part of the county. The

[8] A. L. ZACHARY, assistant professor of agronomy, Purdue University, assisted in writing this section.

TABLE 9.—*Estimated degree and kind of limitation*

[No estimates are given for Borrow pits, Clay pits, Lake beaches, the Milford-

Recreation group, soil or land type, and map symbol	Playgrounds, athletic fields, and other intensive play areas	Picnic grounds, parks, and other extensive play areas
Group 1: Carlisle: Ca. Linwood: Lm Marl beds: Mb Marsh: Mh. Tawas: Ta. Wallkill: Wa. Warners: We.	Very severe: high water table; ponding; very poor trafficability when wet; very high compressibility; sod easily damaged; subject to soil blowing when dry.	Very severe: high water table; ponding; very poor trafficability when wet; very high compressibility; turf easily damaged; subject to soil blowing when dry.
Group 2: Bono: Bn. Gilford: Gd, Gf, Gm. Maumee: Mm, Mn. Milford: Mo, Mr' Ms. Pewamo: Pc, Pe. Rensselaer: Re, Rn, Rr, Rs. Wauseon: Wo.	Severe: high water table; poor trafficability; sod easily damaged when wet; very sticky when wet.	Severe: high water table; poor trafficability; sod easily damaged when wet; very sticky when wet.
Group 3: Alida: Ad, Al. Blount: BlA. Brady: Br. Darroch: Da. Del Rey: De, Dl. Elliott: El. Watseka: Wk, Wl. Whitaker: Wt.	Moderate: seasonal high water table; compact and sticky when wet; slow to dry after rainfall.	Moderate: seasonal high water table; compact and sticky when wet; slow to dry after rainfall.
Group 4: Markham: MaB2. Morley: MuB, MuC2, MuD2, MuE, MvB3, MvC3, MvE3.	Moderate: slow permeability; erodible; compacts easily when wet. Severe if slope is more than 6 percent.	Moderate: slow permeability; erodible; compacts easily when wet; silt content high in surface layer. Severe if slope is more than 12 percent.
Group 5: Door: DoA, DoB, DrB. Lydick: LyA, LyB. Oshtemo: OsA, OsB, OsC. Tracy: TcA, TcB, TcC, TrB.	Slight: sticky for short periods after rainfall. Moderate if slope is 2 to 6 percent; severe if more than 6 percent.	Slight: sticky for short periods after rainfall. Moderate if slope is more than 6 percent.
Group 6: Brems: BsB. Dune land: Du. Oakville: OaE. Plainfield: PlB, PlC. Sparta: SpB, SrB. Tyner: TyB.	Severe: droughty; erodible; hard to stabilize; supports limited vegetation; difficult to maintain vegetation.	Severe: droughty; erodible; subject to soil blowing; hard to stabilize; supports limited vegetation; difficult to maintain vegetation.

for specified recreational uses

Linwood-Wallkill complex, the Oakville-Tawas complex, and Urban land]

Paths and trails	Golf fairways	Cottages and service buildings	Campsites for tents and trailers
Very severe: high water table; ponding; very poor trafficability; difficult to maintain paths and trails.	Very severe: high water table; ponding; very poor trafficability; turf easily damaged.	Very severe: high water table; ponding; organic material unstable; very high compressibility; high shrink-swell potential; subject to soil blowing when dry.	Very severe: sites remain wet for long periods; very poor trafficability; difficult to maintain walks and roads; unstable material; subject to soil blowing when dry.
Severe: wet for long periods; muddy and slippery when wet; difficult to maintain paths and trails.	Severe: high water table; poor trafficability; turf easily damaged when wet.	Severe: high water table; subject to frost heave; wetness hinders construction work.	Severe: sites remain wet for long periods; difficult to maintain walks and roads; very sticky when wet.
Moderate: wet for short periods; muddy and slippery when wet.	Moderate: seasonal high water table; compacts easily when wet; turf easily damaged.	Moderate: seasonal water table; subject to frost heave; moderate to high shrink-swell potential.	Moderate: sites remain wet and soft for short periods; compacts easily; walks and roads need surfacing.
Slight: muddy and slippery when wet.	Moderate: slow permeability; erodible; turf easily damaged when wet. Severe if slope is more than 12 percent.	Moderate: slow permeability; subject to frost heave; moderate to high shrink-swell potential. Severe if slope is more than 12 percent.	Moderate: sites remain wet for short periods; compacts easily; walks and roads need surfacing. Severe if slope is more than 12 percent.
Slight: surface sticky and slippery when wet.	Slight if slope is less than 6 percent; moderate if more than 6 percent.	Slight if slope is less than 6 percent; moderate if more than 6 percent.	Slight: sticky for short period after rainfall. Moderate if slopes are more than 6 percent.
Severe: poor stability on slopes; difficult to maintain paths and trails; erodible.	Severe; droughty; erodible; turf difficult to maintain.	Slight: vegetation difficult to establish; difficult to vegetate; erodible on slopes. Moderate if slope is 6 to 12 percent; severe if more than 12 percent.	Severe: droughty; erodible; vegetation difficult to maintain.

remaining and southernmost part of the county is 4 to 8 miles wide and is included in the Kankakee Basin.

The plain of former glacial Lake Chicago is subdivided into distinct topographic steps by three ancient beach lines. By these steps the land level rises from Lake Michigan (581 feet above sea level) to the elevation of the Valparaiso moraine. The northern terrace, Tolleston Beach, has the lowest elevation of the terraces. It is 10 to 24 feet higher than Lake Michigan. The soils on this terrace formed in the same kind of parent material and at about the same time as soils on the other beach levels of the glacial lake plain. West of Gary, the topography is characterized by long, narrow, continuous, parallel ridges and sloughs that extend in the same general direction as the lake shore. The Oakville soils and Tawas muck formed in this area. The excessively drained Oakville soils formed on the high ridges, and the very poorly drained Tawas soils formed in the narrow, marshy sloughs.

East of Gary, wind has heaped the sand into irregular dunes that have peaks more than 100 feet high. The Oakville soils and Dune land are in this area. The middle terrace, Calumet Beach, forms a belt more than 2 miles wide. It lies south of Tolleston Beach and is about 48 feet higher than Lake Michigan. Calumet Beach is traversed by Ridge Road (U. S. Highway No. 6). The Little Calumet River flows through this middle terrace at an elevation of about 20 feet above the lake. In the coarse-textured materials of Calumet Beach, the Plainfield soils developed on the ridges, and the Watseka soils in the nearly level areas. Also, in this middle terrace area are the Bono, Maumee, and Warners soils.

The southern terrace, Glenwood Beach, is about 80 feet above Lake Michigan and occurs adjacent to or just north of Lincoln Highway. This terrace is the highest and oldest of the ancient beaches, and it marks the northern edge of the soils underlain by glacial till. It passes through Dyer, north of Merrillville, and south of Hobart. It is a sand ridge that has been eroded in many places. This terrace furnished parent material for the Bono, Maumee, Del Rey, Whitaker, and similar soils.

The morainic belt in this county is nearly level to steep. It consists of three comparatively high terminal moraines that are separated by two areas of lower and smoother ground moraines. The three morainic ridges cross the county from east to west. One of these is south of Merrillville, one is near Crown Point, and the third is near Lowell.

Cutting these ridges at right angles are several glacial drainage channels, or chains of depressions. Except for Dune land, the roughest land in the county is around these drainage channels and depressions. In this physiographic area, the Morley, Blount, Pewamo, Markham, and Elliott soils developed on glacial till. Glacial till, or unsorted material deposited by ice, consists of particles of all sizes from clay to gravel, and it also contains varying amounts of stones and boulders. The till is mainly of clay loam or silty clay loam texture. In this area Carlisle muck occurs in several depressions, where it developed in organic materials.

The Kankakee Basin is made up of two distinct topographic belts, an outwash plain and a lake plain. The outwash plain borders the southern edge of the Valparaiso moraine and is separated from it by only slight changes of elevation. The outwash plain slopes southward. Some of the soils on it are the Door, Lydick, Oshtemo, and Tyner.

The lake plain is south of the outwash plain and slopes slightly westward. This nearly level slope is broken only by a few windblown sand ridges. Silty and clayey materials were deposited in the lake plains. The Gilford and the Rensselaer soils developed from these materials and have a moderately fine textured subsoil.

Climate

Lake County has a temperate, humid, continental climate that essentially is uniform throughout the entire county. The monthly mean temperature is 51° F., but the range of temperature from summer to winter is wide. The mean annual precipitation is 36 inches. Precipitation is fairly well distributed throughout the year but is slightly greater in spring than in other months.

Climate influences the formation of soils in the county largely through moderately heavy amounts of precipitation. The rains and melting snows seep slowly downward through the soils and cause physical and chemical changes. Physically, the percolating water removes the clay particles from the surface layer and translocates them to the subsoil. Accumulation of clay in the subsoil is characteristic of most soils in the county. Chemically, the percolating water dissolves minerals and moves them downward through the soils. As a result of this leaching, the free calcium carbonate has been removed from the surface layer and subsoil of most soils in Lake County, and reaction therefore is slightly acid to medium acid in those layers.

The soils are frozen for 3 or 4 months each year. During this period the soil-forming factors are mainly dormant except for some freezing and thawing action.

Climate indirectly influences the formation of soils by stimulating the growth of living organisms, especially vegetation. The climate of Lake County is conducive to growth of hardwoods, which directly influence the formation of soils classified as Alfisols.

A more detailed account of the climate of Lake County is given in the section "General Nature of the County."

Plant and animal life

Plants have been the principal living organisms that have influenced the formation of soils in Lake County, but micro-organisms, earthworms, and other forms of life also have contributed to the morphology of the soils. Bacteria and fungi are micro-organisms that affect the soils. They cause plants to decompose into humus that is incorporated into the soils. Trees, legumes, and grasses take in plant nutrients from the lower layers of the profile and return most of the nutrients to the upper layers in the form of leaf and grass litter.

The native vegetation of the county consisted of deciduous hardwood trees, prairie grasses, water-tolerant grasses, various sedges, and a few water-tolerant trees.

Soils were affected greatly by the type of vegetation under which they formed. Grasses have many fine fibrous roots that, together with the top growth, add large amounts of organic matter to the soils each year. Soils that formed under grasses therefore have a thick, black

to dark-brown surface layer. Door soils are of this kind. In contrast, soils that formed under trees have a thin, light-colored surface layer because the organic matter was derived principally from leaves deposited mostly on the soil surface. Morley soils are of this kind.

Organisms are important in decomposing the large amount of organic matter that accumulates on the surface each year. The disintegration, decomposition, and incorporation of organic matter into the soils are largely accomplished by the organisms that live in the soil. The kinds of organisms in the soils vary with such factors as climate, physical and chemical properties of the soils, and the kinds of vegetation growing on the soils. These organisms influence the kind of humus layer, the development of the profile, and the physiochemical properties of the soils.

Topography

Variation in the land surface influences the formation of soils by affecting the degree of drainage and erosion. Topography has its greatest influence on the formation of soils by restricting internal drainage. In depressions and in many nearly level areas, the drainage of soils is restricted by a high water table. Soils having a high water table cannot be used intensively until the water table is lowered by establishing a suitable drainage system.

The effect of drainage on the morphology of soil is evident when a comparison is made between soils that formed in similar parent material but under different drainage classes. The poorly drained Pewamo soils formed in depressional areas in till of silty clay loam or clay loam texture. These soils have a thick, very dark gray surface layer and a grayish subsoil that is mottled with yellowish brown. The Morley soils also formed in till of silty clay loam or clay loam texture, but they formed in gently sloping to steep areas. These soils have a dark grayish-brown and brown surface layer and a subsoil that is yellowish brown in the upper part.

Surface drainage has less effect on soil formation than internal drainage. Soils that form in silty clay loam in steep areas are not so strongly developed as those that form in nearly level to moderately sloping areas. This difference in soil development is due to (1) rapid geologic erosion, (2) reduced percolation of water through the soil, and (3) lack of enough water in the soils for vigorous growth of the plants that aid soil formation. The degree to which soils develop in a given time, in a given parent material, and under the same kind of vegetation depends largely on the amount of water that passes through the soil material.

Time

Time determines, to a great extent, the age of a soil or the degree of profile development, though the influence of time may be modified by erosion, deposition of materials, topography, and kind of parent material. For a soil to show the full impact of time, the parent material should remain free from disturbances. Such ideal situations are not common. Surface erosion and mass movement of superficial material cause some removal and disturbance, even where slopes are gentle. Soils that formed on recent alluvial or windblown materials, or on steep slopes where erosion has been more active, may show little development. They can be thought of as young soils. A mature soil has well-defined, genetically related horizons because the rate of soil formation has exceeded the rate of geologic erosion. The Morley soils are mature. The Oakville soils developed in recent windblown sand. They show little horizon development and are immature, or young, soils.

Processes of Soil Formation

Processes important in the formation of horizons in the soils of this county are (1) the accumulation of organic matter; (2) the solution, transfer, and reprecipitation of calcium carbonates and bases; (3) the liberation, reduction, and transfer of iron; and (4) the formation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in the development of horizons.

The accumulation of organic matter in the upper part of the profile has been important in formation of the A1 horizon. In general, soils that have the highest content of organic matter have the thickest or darkest surface horizons and, in the natural environment, support the most grass.

Carbonates and bases have been leached from the upper horizons of nearly all of the soils of this county. This leaching has contributed to horizon development. Soil scientists generally agree that the removal of carbonates from the upper horizons of a soil normally precedes the translocation of silicate clay minerals.

The clay accumulates in pores and forms films on the ped surfaces along which water moves. In the soils of this county, leaching of bases and the translocation of silicate clays are among the more important processes in horizon differentiation. The Morley soils are an example of soils that have translocated silicate clays in the form of clay films accumulated in the B2t horizon.

The reduction and transfer of iron, a process called gleying, is evident in the poorly drained Pewamo soils. The gray color in the subsoil indicates the reduction and loss of iron. Some horizons contain mottles, which indicate segregation of iron.

Classification of Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships to each other and to the whole environment, and develop principles that help us to understand their behavior and response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and to other tracts of land.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and was later revised (*5*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*4*) and was adopted in 1965 (*7*). It is under continual study.

The current system consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the

family, and the series. The criteria for classification are soil properties that are measurable or observable, and these properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

In table 10 the soil series of Lake County are classified according to family, subgroup, and order in the current system of classification.

Following are brief descriptions of each of the six categories in the current system of classification.

Order.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, the Entisols and Histosols, occur in many different climates.

Table 10 shows the five soil orders in Lake County: Entisols, Inceptisols, Mollisols, Alfisols, and Histosols. Entisols are recent soils. They do not have genetic horizons, or they have only the beginnings of such horizons. Inceptisols occur mostly on young, but not recent, land surfaces. Mollisols generally form under grass vegetation and have a thick, dark-colored surface layer called the mollic epipedon. Alfisols are soils that have clay-enriched B horizons and a base saturation of more than 50 percent. Histosols are soils that formed in water in organic material and some mineral matter.

Suborder.—Each order is separated into suborders, primarily on the basis of those soil characteristics that seem to produce classes of the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or differences resulting from climate or vegetation.

Great groups.—Each suborder is separated into great groups on the basis of uniformity in the kinds and sequence of major horizons and soil features. The horizons considered are those in which clay, iron, or humus

TABLE 10.—*Soil series in Lake County, Ind., classified according to current system of classification*

Soil series	Current classification		
	Family	Subgroup	Order
Alida	Fine-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Blount	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Bono	Fine, illitic, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Brady	Coarse-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Brems	Sandy, mixed, mesic	Aquic Udipsamments	Entisols.
Carlisle	Euic, mesic	Typic Medisaprists	Histosols.
Darroch	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols.
Del Rey	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Del Rey, dark colored variant	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Door	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Elliott	Fine, illitic, mesic	Aquic Argiudolls	Mollisols.
Gilford	Coarse-loamy, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Linwood	Loamy, euic, mesic	Terric Medisaprists	Histosols.
Lydick	Fine-loamy, mixed, mesic	Mollic Hapludalfs	Alfisols.
Markham	Fine, illitic, mesic	Mollic Hapludalfs	Alfisols.
Maumee	Sandy, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Milford	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Morley	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Oakville	Mixed, mesic	Typic Udipsamments	Entisols.
Oshtemo	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Pewamo	Fine, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Pewamo, calcareous variant.[1]	Fine, mixed, calcareous, mesic	Typic Haplaquolls	Mollisols.
Plainfield	Mixed, acid, mesic	Typic Udipsamments	Entisols.
Rensselaer	Fine-loamy, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Rensselaer, calcareous subsoil variant.[2]	Fine-loamy over fine, mixed over illitic, noncalcareous, mesic.	Typic Argiaquolls	Mollisols.
Sparta	Sandy, mixed, mesic	Entic Hapludolls	Mollisols.
Tawas [3]	Sandy, euic, mesic	Terric Medisaprists	Histosols.
Tracy	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Tyner	Sandy, mixed, mesic	Typic Udipsamments	Entisols.
Wallkill	Fine-loamy, mixed, nonacid, mesic	Thapto-Histic Haplaquepts	Inceptisols.
Warners	Fine-silty, mixed, calcareous, mesic	Typic Haplaquolls	Mollisols.
Watseka	Sandy, mixed, mesic	Aquic Hapludolls	Mollisols.
Watseka, moderately deep variant.	Sandy over clayey, mixed, mesic	Aquic Hapludolls	Mollisols.
Wauseon	Coarse-loamy over clay, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Whitaker	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.

[1] Differs from other Pewamo soils in that it lacks an argillic horizon and is calcareous in the B horizon.

[2] Differs from other Rensselaer soils in that it lacks an argillic horizon, has calcareous material in the solum, and has silty clay loam in the IIC material.

[3] The soils in this survey that are called "Tawas" were reclassified as "Adrian" after the soil map had been prepared for publication.

has accumulated and those that have pans that interfere with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like.

Subgroups.—Each great group is separated into subgroups. One subgroup represents the central (typic) segment of the group. The other subgroups, called intergrades, have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order.

Families.—Families are established within subgroups, primarily on the basis of properties that affect the growth of plants or the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

General Nature of the County

This section discusses the climate, history of settlement, drainage, water supply, transportation, and industry of Lake County. It also gives information about farming. The statistics on farming are from the 1964 Census of Agriculture.

Climate [9]

The climate in Lake County is characterized by the wide variations in temperature that are typical of areas in the middle latitudes of the interior of our continent. Winds from Lake Michigan, the northern boundary of the county, modify the extreme temperatures and some aspects of precipitation. In summer, north winds from the lake have a cooling effect, especially in the northern part of the county. Late in fall and early in winter, however, the winds from the lake are comparatively warming. When prevailing winds are not from the lake, the extreme temperatures prevail but generally are higher late in fall and early in winter than temperatures farther south in the State.

The information given in this section and the data in tables 11 and 12 are based on records kept at Hobart and generally apply to the northern areas of the county. According to measurements taken at Wheatfield, the climate of the southern part is similar to that in the Kankakee River Basin area, where the lowlands are more susceptible to untimely frosts that limit the growing season.

Weather changes are caused every few days by passing weather fronts that bring centers of low or high air pressure. In general a high brings lower temperatures, lower humidity, and sunny days. When a low approaches, temperatures rise, southerly winds increase, humidity heightens, and rains or showers occur. These weather changes are greatest late in summer and early in fall.

[9] Prepared by L. A. SCHALL, State climatologist, National Weather Service.

Precipitation in the county is fairly well distributed throughout the year. Rainfall in spring and early in summer tends to exceed the amount of precipitation in winter. The spring rains insure a near-maximum supply of soil moisture that lasts into summer when evaporation losses exceed replacement of moisture by rainfall and soil drying is likely. A severe drought has never been recorded for the county. About one-third of the annual rainfall flows into streams and out of the area. Future needs may require conservation of this water. Table 11 lists the frequency in 100 years of unusually heavy rainfall in Lake County in 1 hour, 6 hours, and 12 hours.

TABLE 11.—*Frequency of specified amounts of rainfall to be expected during stated time intervals*

[Taken from weather study records at Hobart, Ind.]

Frequency	Inches of rain for the duration of—		
	1 hour	6 hours	12 hours
4 times in 100 years	2.5	3.7	4.1
10 times in 100 years	2.1	3.1	3.4
20 times in 100 years	1.7	2.7	3.0

In some winters snowfall is heavy, and in others it is light. The heaviest snowstorms come out of the southwest. As they swirl northeastward, an abundance of moisture moves in from the Gulf of Mexico. A storm out of the northwest brings an inflow of colder, drier air and leaves less snow. Thus, some midwinters are cold, but the amount of snowfall is only normal or less than normal. In winter northerly winds from Lake Michigan often bring snow, but generally only a flurry. The frequency and intensity diminish as storms move southward in the county, and accumulations are small unless the storm is full blown and has passed through the Lakes region.

Winds blow most frequently from the southwest, but occasionally in winter prevailing winds are from the northwest. Damaging winds are brought in by weather lows passing through the region, by thunderstorms, or by tornadoes. Thunderstorms occur on about 46 days of the year, mostly in spring and early in summer. They seldom are severe enough to cause loss of life, property, or crops. Tornadoes are infrequent in Lake County.

Relative humidity is not measured at the Hobart weather station. Estimates are based on the climatology of the area. Relative humidity on sunny summer days ranges from 40 percent or more in the early afternoon to 90 percent or more by sunrise. Relative humidity rises and falls much as does temperature during a typical day, but the highest percentage generally occurs with the lowest temperature and the lowest percentage with the highest temperature. Cold fronts also lower relative humidity.

The column "Average heating degree-days" in table 12 provides a comparative number, or average, for calculating relative heating requirements for dwellings. Fuel consumption for heating is proportional to total degree

TABLE 12.—*Selected*

[Data from Weather Bureau Station at Hobart, Ind. Elevation 600 feet. Abstracted from

Month	Temperature							Average heating degree-days [1]	Rainfall		
	Average daily maximum	Average daily minimum	Average	Record high	Year	Record low	Year		Average	Maximum in 24-hour period	Year
	°F.	°F.	°F.	°F.		°F.			Inches	Inches	
January	33.4	17.4	25.4	67	1950	−22	1963	1,181	1.86	1.78	1960
February	36.3	19.7	28.0	67	1954	−19	1936	1,019	1.85	2.37	1939
March	46.5	28.4	37.5	84	1939	−11	1943	871	2.66	2.15	1954
April	60.0	38.3	49.2	91	1942	18	1936	480	3.46	3.14	1947
May	71.9	47.6	59.8	101	1934	26	1938	217	3.99	2.60	1940
June	81.6	57.8	69.7	105	1934	35	1945	48	4.47	5.64	[3] 1941
July	86.2	61.1	73.7	109	1934	43	1940	0	3.67	4.72	1957
August	85.0	61.1	73.1	104	1934	40	1951	6	3.36	4.13	1955
September	77.7	53.5	65.6	105	1939	28	1942	87	3.15	2.34	1961
October	67.2	43.6	55.4	92	1938	21	1962	335	3.04	4.74	1954
November	49.5	32.0	40.8	80	[3] 1950	−5	1950	732	2.58	3.45	1951
December	36.5	21.0	28.8	65	1951	−19	1950	1,097	1.92	5.29	1949
Year	61.0	40.1	50.6	109	1934	−22	1963	6,073	36.01	5.64	1941

[1] Based on a temperature of 65° F. and computed from average monthly temperatures. These data show relative heating requirements for dwellings. Degree-days for a single day are obtained by substracting the average temperature of the day from 65°.
[2] Based on a 10-year record.
[3] Also earlier dates.

days, that is, a month that has twice as many degree-days as another month requires twice as much fuel for heating.

The growing season generally is the period between the last frost (32° F.) in spring and the first in fall. From the Lake Michigan area to the lowlands in the southern part of the county, the length of the season varies greatly. In the northern part of the county, the average date of the last frost in spring occurs during the last week of April, but in the lowlands it occurs on about May 10. In fall the average date of the first frost in the north is about October 16, but in the south it occurs about two weeks earlier. Thus, the growing season in the south is several weeks shorter than that in the north. This difference is offset, however, by warmer daytime temperatures in the south. The county has a climate that is relatively complex because of influences from Lake Michigan, wetness in the lowlands, and the differences in lay of the land within very short distances.

Settlement of the County

The treaty with the Pottawatomie Indians for the territory that is now Lake County was negotiated from 1828 to 1832. In 1833 the first stageline to serve the area was established, in 1834 government surveyors arrived, and then came the "squatters" who made land deals for about $1.25 per acre. In 1837 the Indiana legislature declared Lake County independent and removed it from the jurisdiction of Porter County.

In 1850 the population of the county numbered 3,991. Farmers accounted for more than 60 percent of this number. The Lake County Agricultural Society was formed in 1851. By 1964 the population of the county had increased to 519,600. Of this number about 35 percent lived in Gary, about 21 percent in Hammond, and 10 percent in East Chicago. The population anticipated for Lake County in 1980 is 865,500.

The first industries in the county were established in the middle of the 19th century and consisted of sawmills run by water to process lumber for homes, grist and flour mills, and one or two iron-casting foundries. During most of the 19th century, the economy of Lake County was largely self-contained and without significant ties to Chicago, the dominant industrial center of the area. By the turn of the 20th century, however, the northern part of Lake County, together with other cities in the Calumet area south of Chicago, was a specialized subcenter of the Chicago industrial center.

Drainage

The drainage divide between the Mississippi and St. Lawrence basins crosses Lake County from east to west in a crooked line that passes to the south of Crown Point. The northern slope of the divide drains into the Calumet River and its branches, and the southern slope into the Kankakee River system. The Little Calumet River is the primary drainage channel for the Lake Michigan regional watershed. Much of the land in the northern and southern parts of the county originally was marshy, but now most of these areas are artificially drained.

Although drainage practices have changed greatly in the past 50 years, a number of marshy or swampy areas

weather data

climatological summary for the Lake County area for the period 1934 through 1963]

	Precipitation					Average number of days			
	Snow and sleet					Temperature			
Average					Of 10 inches or more [2]	Maximum		Minimum	
	Maximum for month	Year	Maximum in 24-hour period	Year		90° F. and above	32° F. and below	Between 0° and 32° F.	0° F. and below
Inches	*Inches*		*Inches*		*Days*				
6. 8	18. 1	1939	12. 0	1939	3	0	13	29	
6. 2	16. 8	1956	11. 0	1956	5	0	9	25	
3. 7	11. 4	[3] 1960	5. 0	1945	6	0	3	22	(4)
. 9	9. 0	1938	4. 7	1961	8	(4)	(4)	8	
[5] T	. 5	1940	. 5	1940	7	2	(4)	1	
0	0	----------	0	----------	6	6	0	0	
0	0	----------	0	----------	7	9	0	0	
0	0	----------	0	----------	5	9	0	0	
T	3. 0	1942	2. 7	1942	5	4	0	(4)	
T	2. 0	1937	2. 0	1937	6	(4)	0	3	
3. 0	11. 0	1937	6. 0	1951	5	0	2	16	(4)
7. 0	20. 3	1944	11. 7	1960	4	0	10	27	
27. 6	20. 3	1944	12. 0	1939	67	30	37	131	

[4] Less than half a day.
[5] Trace.

adjacent to lakes, creeks, and rivers remain too wet for farming and many other uses.

The major drainage channels in the county do not provide good drainage for storm water. Adequate control of floodwater from the Kankakee and Little Calumet Rivers, as well as proper maintenance of major drainage channels, is a major consideration.

Water Supply

In Lake County the water supply for farms, homes, and industry and for protection of the communities has two sources. In the highly industrial Calumet area, which includes the northern part of the county, the primary source of water is Lake Michigan. In the mainly residential central and southern parts of the county, wells are the chief source. Direct precipitation, another important source of water supply, has been largely responsible for the great growth of farming in Lake County.

Transportation

The Lake County area is served by many railroads and several U.S., State, and interstate highway systems. All lead to and from metropolitan Chicago, and from that point the rest of the country is easily accessible. The Grand Calumet River provides the Lake County area with a direct channel to and from the vast Mississippi River waterways system that reaches to the Gulf of Mexico. From Lake Michigan there is easy access to and from ports along the other Great Lakes and the St. Lawrence Seaway and, subsequently, to the major ports of the world.

Industry

Lake County is part of one of the prime industrial centers of the Midwest. The Gary-Hammond-East Chicago-Whiting area, along Lake Michigan, is densely populated and is an integral part of the metropolitan Chicago industrial center. In this area of the county are steel mills, refineries, and many kinds of manufacturing industries, where industrial growth and development are linked to trends in the Chicago center.

The economy of the county is supported by manufacturing, mineral industries, services, wholesale and retail trades, and farming. More than 50 percent of the economy is supported by manufacturing, which also accounts for more than 50 percent of the employment in the county. Farming represents less than 1 percent of the economy.

Industrial activities are concentrated in the steel, iron, and nonferrous metal industries. Other industries of importance in the county are chemicals, petroleum, and fabricated metal products.

Farming

The growth of Chicago and the building of the railroads in the 1850's provided a market for farm produce and excellent transportation to that market. As a result, most of the best arable land in the county was put under cultivation. The acreage used for farming continued to in-

crease until 1880, when about 74 percent of the county was used for farming. As the county urbanized, however, the acreage farmed steadily decreased.

In 1964 the 932 farms in Lake County represented about 53.4 percent of the land area. Farms of 10 to 49 acres were most common. There were 65 farms of 500 acres or more and 59 farms of less than 10 acres. Most of the farms were of the general type. Row crops, small grains, and hay crops were the principal crops.

About 60,000 acres of corn, 30,500 acres of soybeans, 15,600 acres of wheat, and 7,000 acres of oats were planted each year. Vegetable crops, though not extensive, were important to farming. About 7,000 acres of alfalfa and alfalfa mixtures and 3,000 acres of clover, timothy, and clover mixtures were used for hay crops.

There were about 17,700 cattle and calves, 14,000 hogs and pigs, 1,250 sheep and lambs, and 143,700 chickens in the county.

Although the importance of industrial growth in the northern part of Lake County has far surpassed that of farming, farming has remained important to the economy of the central and southern parts of the county.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial, fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity (also termed available water capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Clay loam. Refer to *Texture, soil* in this glossary.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forfinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour. An imaginary line connecting points of equal elevation on the surface of the soil.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Contour stripcropping. Growing crops in strips that follow the contour or that are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Deep soil. A soil that has an "R" layer at a depth of 40 inches or more.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, protect areas downslope from the effects of such runoff.

Drainage, internal soil. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are none, very slow, slow, medium, rapid, and very rapid.

Drainage, natural soil. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uni-

form color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time and, in Podzolic soils, commonly have mottlings below 6 to 16 inches in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drainage, surface. Runoff, or surface flow, of water from an area.

Drift (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Green manure. A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Illuviation. Refer to *Eluviation* in this glossary.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intercrop. A grass-legume or other crop that is seeded in small grain and is plowed under the following spring before the succeeding crops are planted.

Lacustrine deposit. Material deposited in lake water and exposed by lowering the water level or by elevation of the land.

Leaching. The removal of soluble material from soils or other material by percolation.

Leached soil. A soil from which most of the soluble materials have been removed from the entire profile or have been removed from one part of the profile and have accumulated in another.

Loam. Refer to *Texture, soil* in this glossary.

Loess. A fine grained eolian deposit consisting dominantly of silt-sized particles.

Mineral soil. Soil composed mainly of inorganic (mineral) material and low in content of organic material. Its bulk density is greater than that of organic soil.

Moderately deep soil. A soil that has an "R" layer at a depth of 20 to 40 inches.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Types are *terminal, lateral, medial, ground.*

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.*

Mulch. A natural or artificially applied layer of plant residue or other material on the surface of the soil. Mulches are generally used to help conserve moisture, control temperature, prevent surface compaction or crusting, reduce runoff and erosion, improve soil structure, or control weeds. Common mulching materials are wood chips, plant residue, sawdust, and compost.

Organic soil. A general term applied to a soil or to a soil horizon that consists primarily of organic matter, such as peat soil, muck soil, and peaty soil layers. In chemistry, organic refers to the compounds of carbon.

Outlet channel. A waterway constructed or altered primarily to carry water from man-made structures, such as terraces, tile lines, and diversion ditches.

Outwash. Crossbedded gravel, sand, and silt deposited by melt water as it flowed from the receding glacier.

Peat. Unconsolidated soil material, largely undecomposed organic matter, that has accumulated where there has been excess moisture.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Percolation. The vertical and horizontal movement of water through the soil.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degree of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Shallow soil. A soil that has an "R" layer at a depth of 20 inches or less.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm to the soil. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till. Unstratified glacial drift consisting of intermingled clay, sand, gravel, and boulders.

Tilth, soil. The condition of the soil, especially soil structure, in relation to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Special crop group		Shrub group	Wildlife group	Recreation group
			Symbol	Page	Number	Page	Number	Number	Number
OkB	Oakville-Tawas complex, 0 to 6 percent slopes	26	VIIIs-1	46	--	--	--	--	--
OsA	Oshtemo fine sandy loam, 0 to 2 percent slopes	27	IIIs-2	45	6	50	4	6	5
OsB	Oshtemo fine sandy loam, 2 to 6 percent slopes	27	IIIe-13	43	6	50	4	6	5
OsC	Oshtemo fine sandy loam, 6 to 12 percent slopes	27	IIIe-13	43	8	50	4	6	5
Pc	Pewamo silty clay loam	28	IIw-1	41	3	49	1	3	2
Pe	Pewamo silty clay loam, calcareous variant	29	IIw-1	41	3	49	1	3	2
PlB	Plainfield fine sand, 0 to 6 percent slopes	29	IVs-1	45	7	50	4	7	6
PlC	Plainfield fine sand, 6 to 12 percent slopes	30	VIs-1	46	8	50	4	7	6
Re	Rensselaer loam	30	IIw-1	41	2	49	1	3	2
Rn	Rensselaer loam, sandy substratum	30	IIw-4	42	2	49	1	3	2
Rr	Rensselaer mucky loam, sandy substratum	31	IIw-1	41	2	49	1	3	2
Rs	Rensselaer loam, calcareous subsoil variant	31	IIw-1	41	4	49	1	3	2
SpB	Sparta fine sand, 0 to 4 percent slopes	32	IVs-1	45	7	50	4	7	6
SrB	Sparta fine sand, silty clay loam substratum, 0 to 4 percent slopes	32	IIIs-2	45	6	50	4	7	6
Ta	Tawas muck	34	IIIw-8	44	1	49	1	2	1
TcA	Tracy loam, 0 to 2 percent slopes	34	I-1	40	6	50	3	6	5
TcB	Tracy loam, 2 to 6 percent slopes	34	IIe-2	41	6	50	3	6	5
TcC	Tracy loam, 6 to 12 percent slopes	35	IIIe-3	43	8	50	3	6	5
TrB	Tracy loam, silty clay loam substratum, 2 to 6 percent slopes	35	IIe-2	41	6	50	3	6	5
TyB	Tyner loamy fine sand, 0 to 6 percent slopes	35	IIIs-1	45	7	50	4	7	6
Ur	Urban land	36	VIIIs-1	46	--	--	--	--	--
Wa	Wallkill silt loam	36	IIw-7	42	2	49	1	2	1
We	Warners silt loam	37	VIw-1	46	2	49	1	1	1
Wk	Watseka loamy fine sand	37	IVw-4	45	2	49	2	4	3
Wl	Watseka loamy sand, moderately deep variant	38	IIw-11	43	2	49	2	4	3
Wo	Wauseon fine sandy loam	38	IIw-4	42	2	49	1	3	2
Wt	Whitaker loam	39	IIw-2	41	2	49	2	5	3

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. Information is given in tables as follows:

Acreage and proportionate extent, table 1, p. 8.
Estimated yields, table 2, p. 47.
Engineering uses of the soils, tables 3, 4, and 5, pp. 54 through 69.
Limitations for town and country planning, table 6, p. 70.
Shrub and ground cover plantings, table 7, p. 72.

Map symbol	Mapping unit	Page	Capability unit		Special crop group		Shrub group	Wildlife group	Recreation group
			Symbol	Page	Number	Page	Number	Number	Number
Ad	Alida fine sandy loam	9	IIIw-4	44	2	49	2	5	3
Al	Alida loam	9	IIw-2	41	2	49	2	5	3
BlA	Blount silt loam, 0 to 2 percent slopes	10	IIw-2	41	4	49	2	5	3
Bn	Bono silty clay	10	IIIw-2	44	3	49	1	3	2
Bp	Borrow pits	10	VIIIs-1	46	--	--	--	--	--
Br	Brady fine sandy loam	11	IIIw-4	44	2	49	2	5	3
BsB	Brems fine sand, 0 to 4 percent slopes	11	IVs-1	45	7	50	4	7	6
Ca	Carlisle muck	12	IIIw-8	44	1	49	1	1	1
Cp	Clay pits	12	VIIIs-1	46	--	--	--	--	--
Da	Darroch loam	13	IIw-2	41	2	49	2	5	3
De	Del Rey silt loam	13	IIw-2	41	4	49	2	5	3
Dl	Del Rey silt loam, dark colored variant	14	IIw-2	41	4	49	2	5	3
DoA	Door loam, 0 to 2 percent slopes	15	I-1	40	6	50	3	6	5
DoB	Door loam, 2 to 6 percent slopes	15	IIe-2	41	6	50	3	6	5
DrB	Door loam, silty clay loam substratum, 2 to 6 percent slopes	15	IIe-2	41	6	50	3	6	5
Du	Dune land	15	VIIIs-1	46	8	50	4	7	6
El	Elliott silt loam	16	IIw-2	41	4	49	2	5	3
Gd	Gilford fine sandy loam	16	IIw-4	42	2	49	1	2	2
Gf	Gilford mucky fine sandy loam	16	IIw-4	42	2	49	1	2	2
Gm	Gilford loam	17	IIw-4	42	2	49	1	2	2
Lb	Lake beaches	17	VIIIs-1	46	--	--	--	--	--
Lm	Linwood muck	17	IIIw-8	44	1	49	1	2	1
LyA	Lydick loam, 0 to 2 percent slopes	18	I-1	40	6	50	3	6	5
LyB	Lydick loam, 2 to 6 percent slopes	18	IIe-2	41	6	50	3	6	5
MaB2	Markham silt loam, 2 to 6 percent slopes, eroded	19	IIe-6	41	5	49	3	6	4
Mb	Marl beds	19	VIw-1	46	1	49	1	1	1
Mh	Marsh	20	VIIIw-1	46	--	--	1	1	1
Mm	Maumee loamy fine sand	20	IIIw-1	44	2	49	1	2	2
Mn	Maumee silt loam	20	IIIw-1	44	2	49	1	2	2
Mo	Milford silt loam, overwash	21	IIw-1	41	4	49	1	3	2
Mr	Milford silty clay loam	21	IIw-1	41	3	49	1	3	2
Ms	Milford silty clay loam, sandy substratum	21	IIw-1	41	3	49	1	3	2
Mt	Milford-Linwood-Wallkill complex	21	IIw-1	41	--	--	1	--	--
MuB	Morley silt loam, 2 to 6 percent slopes	22	IIe-6	41	5	49	3	6	4
MuC2	Morley silt loam, 6 to 12 percent slopes, eroded	22	IIIe-6	43	8	50	3	6	4
MuD2	Morley silt loam, 12 to 18 percent slopes, eroded	23	IVe-6	45	8	50	3	6	4
MuE	Morley silt loam, 18 to 25 percent slopes	23	VIe-1	46	8	50	3	6	4
MvB3	Morley silty clay loam, 2 to 6 percent slopes, severely eroded	23	IIIe-6	43	8	50	3	6	4
MvC3	Morley silty clay loam, 6 to 12 percent slopes, severely eroded	24	IVe-6	45	8	50	3	6	4
MvE3	Morley silty clay loam, 18 to 25 percent slopes, severely eroded	24	VIIe-1	46	8	50	3	6	4
OaE	Oakville fine sand, 12 to 25 percent slopes	26	VIIIs-1	46	8	50	4	7	6

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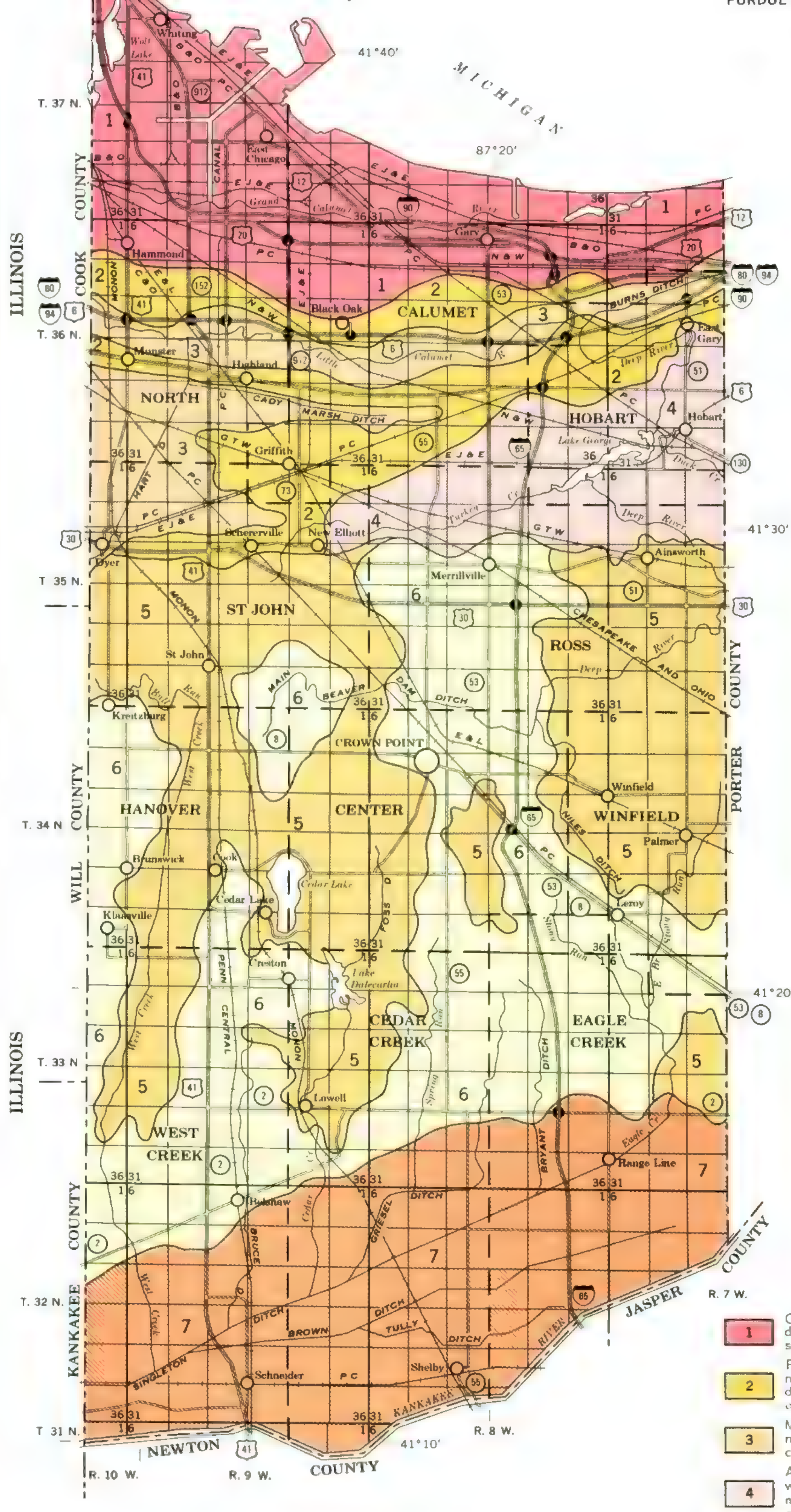
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
LAKE COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles



SOIL ASSOCIATIONS

1 Oakville-Tawas association: Steep to nearly level and depressional, excessively drained and very poorly drained soils that formed in coarse-textured and organic materials

2 Plainfield-Watseka association: Moderately sloping to nearly level, excessively drained and somewhat poorly drained soils that formed in coarse-textured glacial outwash

3 Maumee-Bono-Warners association: Depressional and nearly level, very poorly drained soils that formed in coarse-textured to fine-textured lake sediments

4 Alida-Del Rey-Whitaker association: Nearly level, somewhat poorly drained, moderately coarse textured and medium-textured soils that formed in glacial outwash and lake sediments

5 Morley-Blount-Pewamo association: Steep to nearly level, moderately well drained to poorly drained soils that formed in moderately fine textured glacial till

6 Elliott-Markham-Pewamo association: Nearly level and gently sloping, well-drained to poorly drained soils that formed in moderately fine textured glacial till

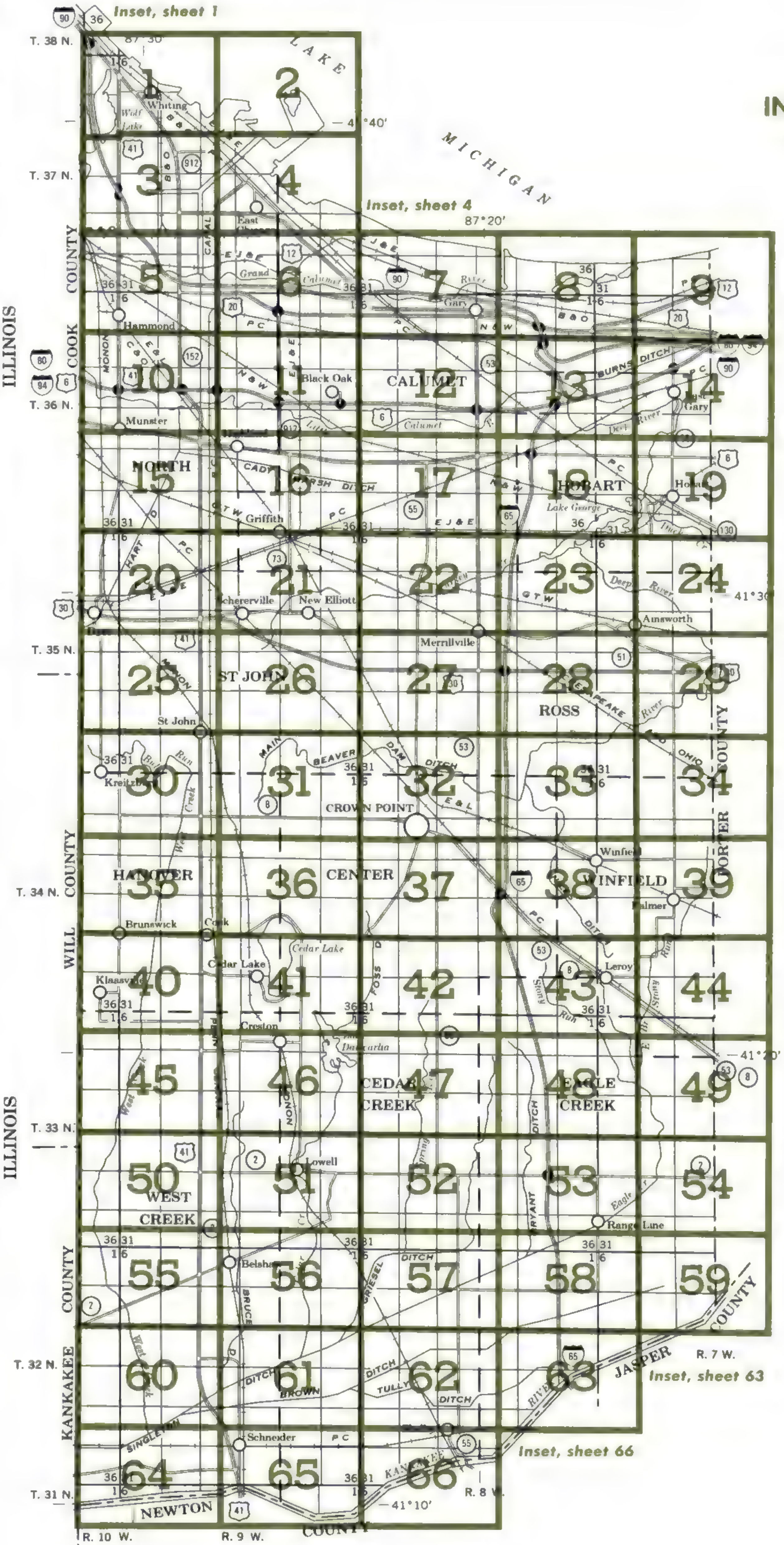
7 Rensselaer-Gilford association: Depressional and nearly level, poorly drained and very poorly drained soils that formed in moderately fine textured to moderately coarse textured glacial outwash

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.

Published 1971

INDEX TO MAP SHEETS
LAKE COUNTY, INDIANA

Scale 1:190,080



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 2 or 3, in the symbol shows that the soil is eroded or severely eroded.

SYMBOL	NAME
Ad	Alida fine sandy loam
Al	Alida loam
BlA	Blount silt loam, 0 to 2 percent slopes
Bn	Bono silty clay
Bp	Borrow pits
Br	Brady fine sandy loam
BsB	Brems fine sand, 0 to 4 percent slopes
Co	Carlisle muck
Cp	Clay pits
Da	Darroch loam
De	Del Rey silt loam
Dl	Del Rey silt loam, dark colored variant
DoA	Door loam, 0 to 2 percent slopes
DoB	Door loam, 2 to 6 percent slopes
DrB	Door loam, silty clay loam substratum, 2 to 6 percent slopes
Du	Dune land
El	Elliott silt loam
Gd	Gilford fine sandy loam
Gf	Gilford mucky fine sandy loam
Gm	Gilford loam
Lb	Lake beaches
Lm	Linwood muck
LyA	Lydick loam, 0 to 2 percent slopes
LyB	Lydick loam, 2 to 6 percent slopes
MaB2	Markham silt loam, 2 to 6 percent slopes, eroded
Mb	Marl beds
Mh	Marsh
Mm	Maumee loamy fine sand
Mn	Maumee silt loam
Mo	Milford silt loam, overwash
Mr	Milford silty clay loam
Ms	Milford silty clay loam, sandy substratum
Mt	Milford-Linwood-Wallkill complex
MuB	Morley silt loam, 2 to 6 percent slopes
MuC2	Morley silt loam, 6 to 12 percent slopes, eroded
MuD2	Morley silt loam, 12 to 18 percent slopes, eroded
MuE	Morley silt loam, 18 to 25 percent slopes
MvB3	Morley silty clay loam, 2 to 6 percent slopes, severely eroded
MvC3	Morley silty clay loam, 6 to 12 percent slopes, severely eroded
MvE3	Morley silty clay loam, 18 to 25 percent slopes, severely eroded
OaE	Oakville fine sand, 12 to 25 percent slopes
OkB	Oakville-Tawas complex, 0 to 6 percent slopes
OsA	Oshtemo fine sandy loam, 0 to 2 percent slopes
OsB	Oshtemo fine sandy loam, 2 to 6 percent slopes
OsC	Oshtemo fine sandy loam, 6 to 12 percent slopes
Pc	Pewamo silty clay loam
Pe	Pewamo silty clay loam, calcareous variant
PlB	Plainfield fine sand, 0 to 6 percent slopes
PlC	Plainfield fine sand, 6 to 12 percent slopes
Re	Rensselaer loam
Rn	Rensselaer loam, sandy substratum
Rr	Rensselaer mucky loam, sandy substratum
Rs	Rensselaer loam, calcareous subsoil variant
SpB	Sparta fine sand, 0 to 4 percent slopes
SrB	Sparta fine sand, silty clay loam substratum, 0 to 4 percent slopes
Ta	Tawas muck
TcA	Tracy loam, 0 to 2 percent slopes
TcB	Tracy loam, 2 to 6 percent slopes
TcC	Tracy loam, 6 to 12 percent slopes
TrB	Tracy loam, silty clay loam substratum, 2 to 6 percent slopes
TyB	Tyner loamy fine sand, 0 to 6 percent slopes
Ur	Urban land
Wa	Wallkill silt loam
We	Warners silt loam
Wk	Watseka loamy fine sand
Wl	Watseka loamy sand, moderately deep variant
Wo	Wauseon fine sandy loam
Wt	Whitaker loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Short steep slope

SOIL SURVEY DATA

Soil boundary and symbol (Dx)

Gravel

Stoniness
- Stony
- Very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gully

Soil map constructed 1970 by Cartographic Division, Soil Conservation Service, USDA, from 1965 aerial photographs. Controlled mosaic based on Indiana plane coordinate system, west zone, transverse Mercator projection, 1927 North American datum.

1

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.
Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 1

LAKE COUNTY, INDIANA NO. 10

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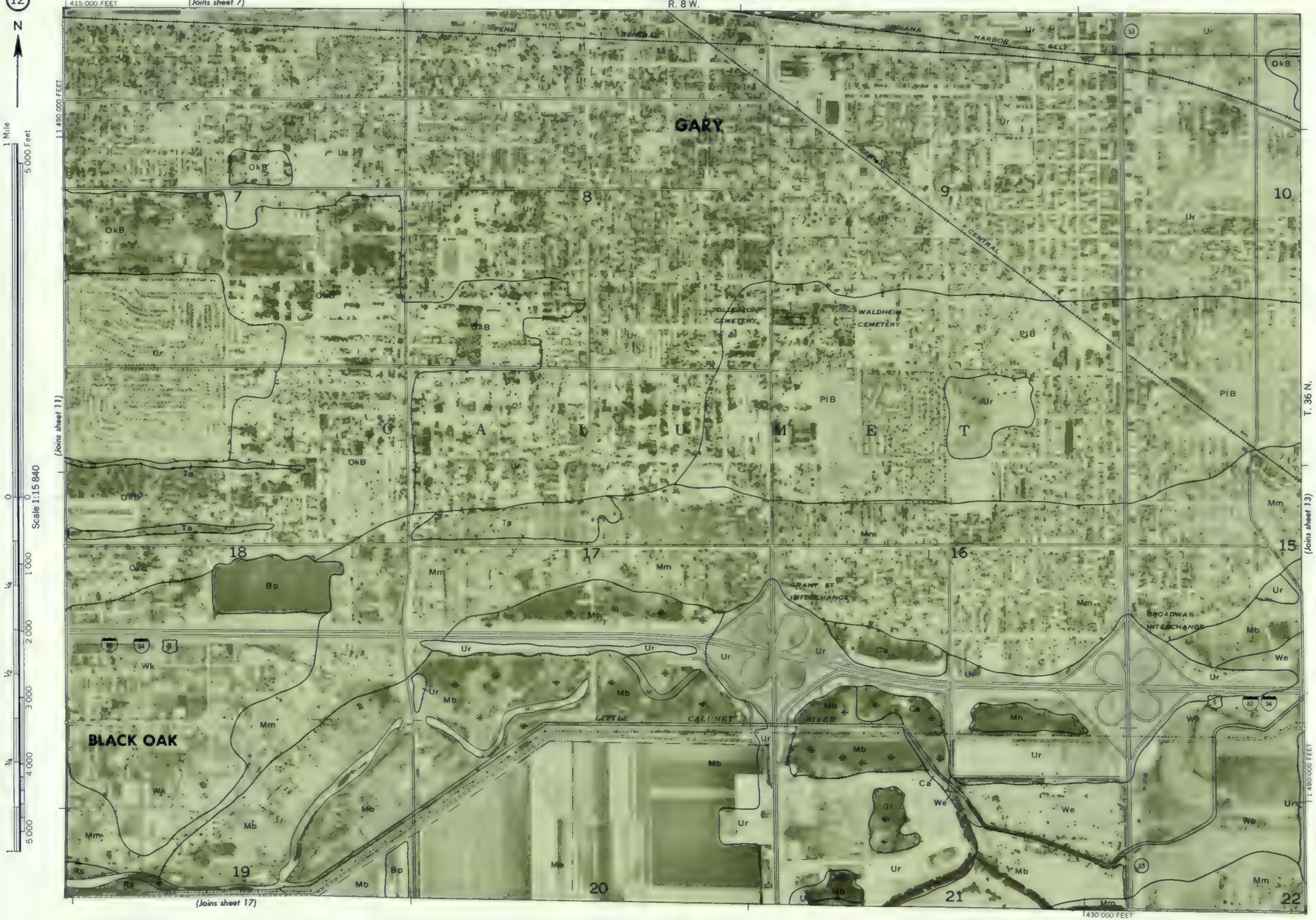
Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 11

(12)

LAKE COUNTY, INDIANA — SHEET NUMBER 12



LAKE COUNTY, INDIANA NO. 12

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LAKE COUNTY, INDIANA — SHEET NUMBER 13

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LAKE COUNTY, INDIANA NO. 13

LAKE COUNTY, INDIANA NO. 14

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LAKE COUNTY, INDIANA NO 15

LAKE COUNTY, INDIANA NO. 16

Photobase from 1965 aerial photography.

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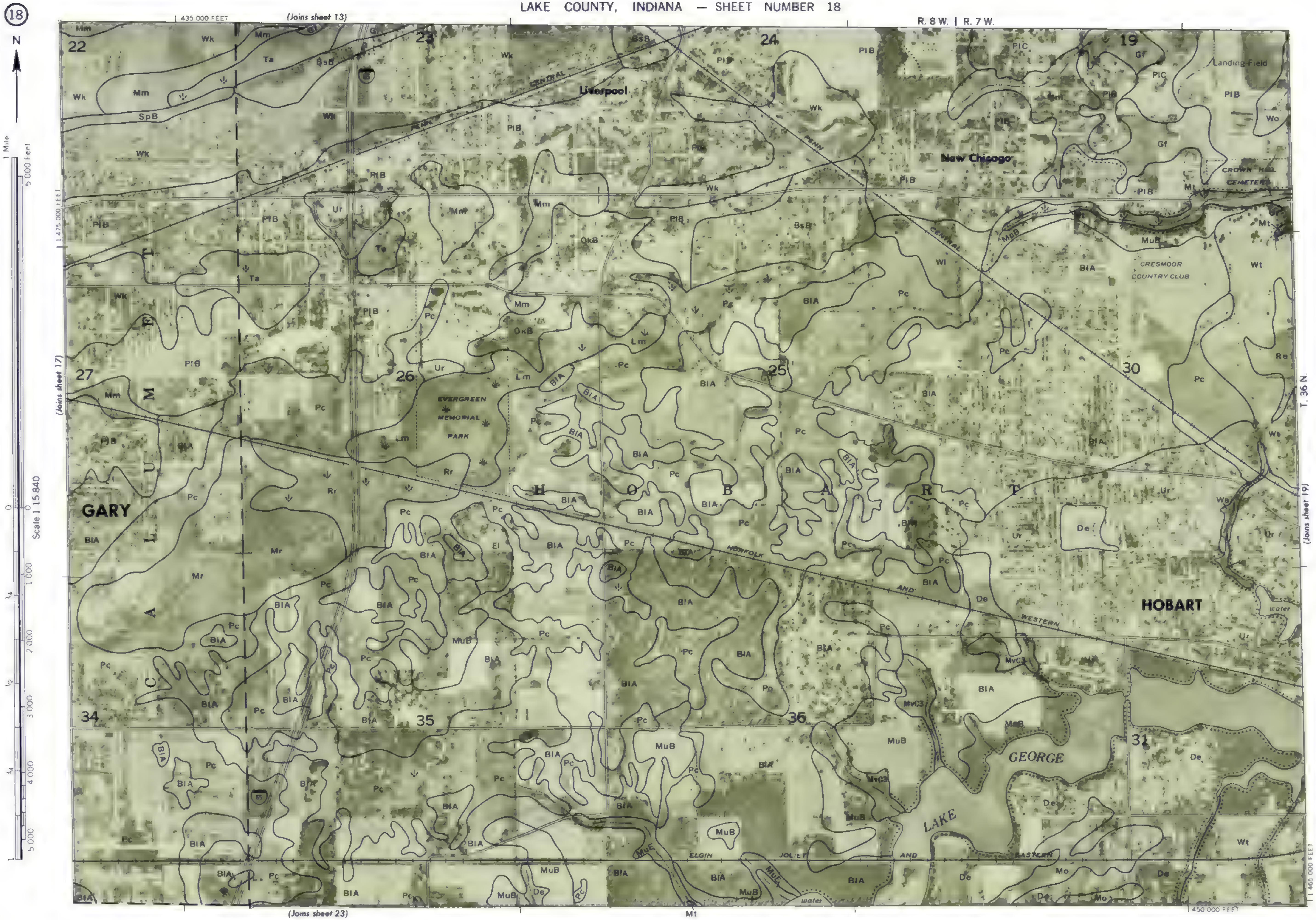
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

LAKE COUNTY, INDIANA NO. 17

LAKE COUNTY, INDIANA — SHEET NUMBER 18



LAKE COUNTY, INDIANA NO. 18

Photobase from 1965 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

LAKE COUNTY, INDIANA — SHEET NUMBER 19

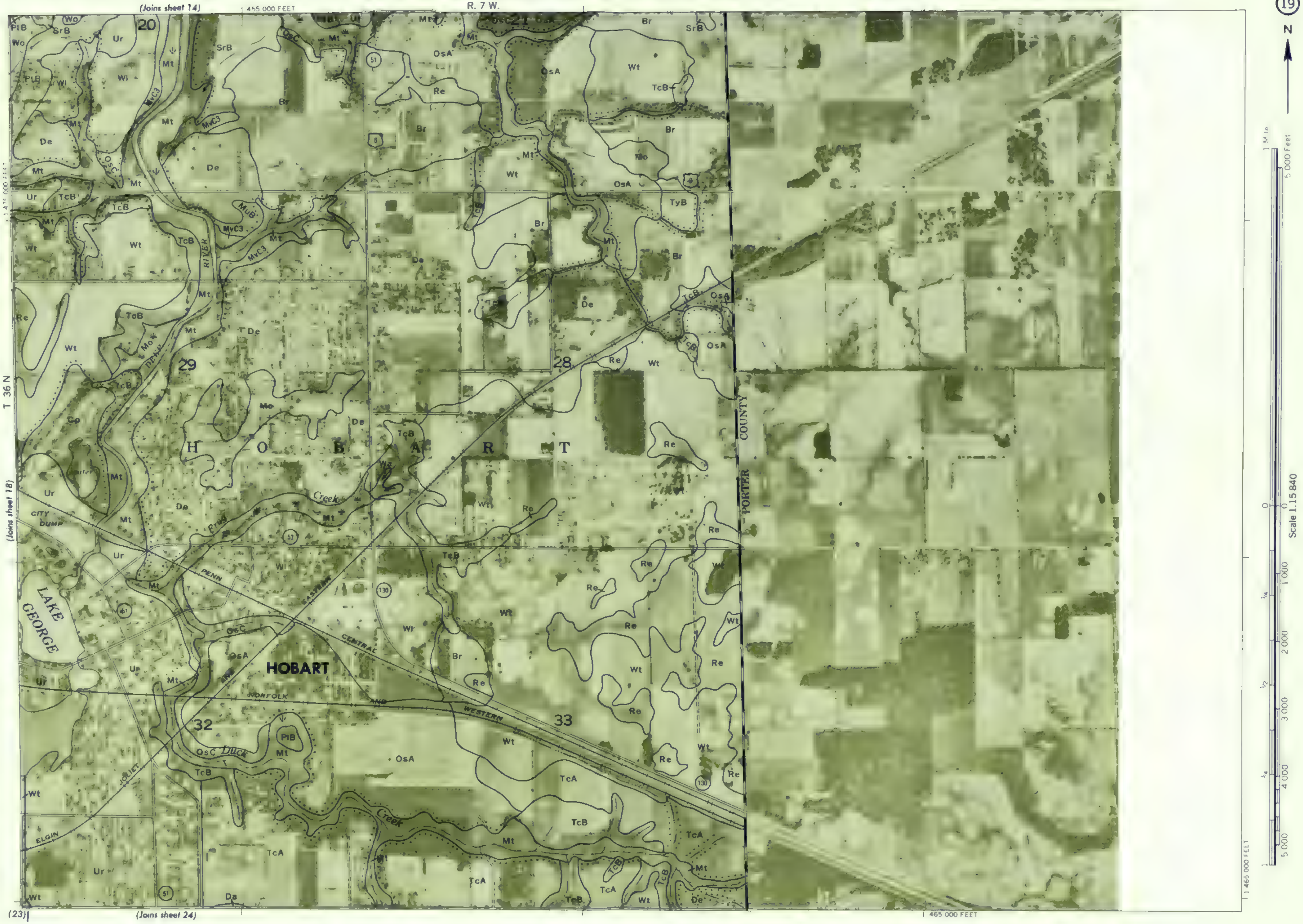
(19)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate

LAKE COUNTY, INDIANA NO 19



LAKE COUNTY, INDIANA — SHEET NUMBER 2

LAKE COUNTY, INDIANA NO. 2

Photobase from 1965 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

LAKE COUNTY, INDIANA NO. 22

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

LAKE COUNTY, INDIANA — SHEET NUMBER 23

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.
Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 23

23

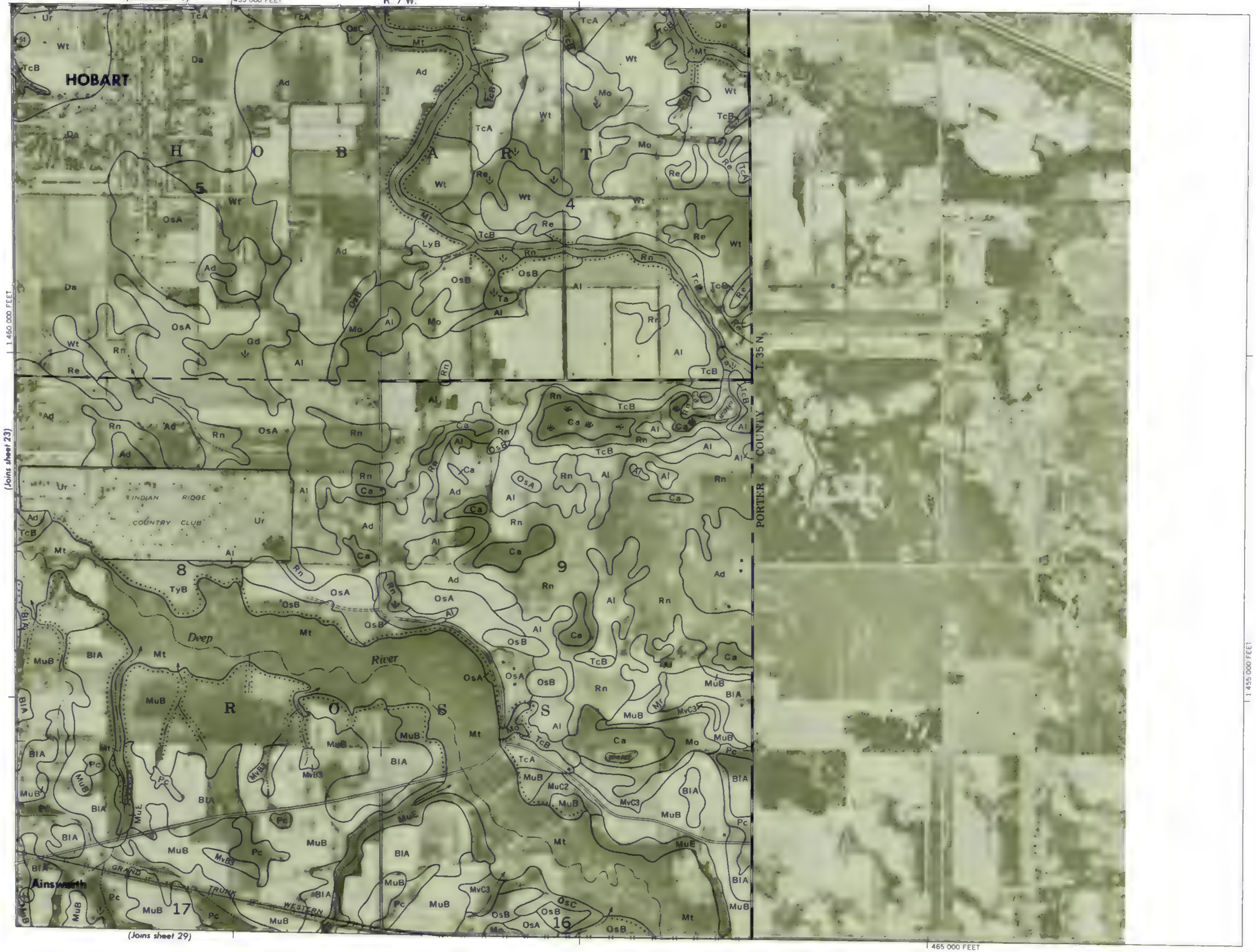
LAKE COUNTY, INDIANA — SHEET NUMBER 24

N

Scale 1:15 840

1 Mile | ¾ | ½ | ¼ | 0 | 1

5 000 Feet | 4 000 | 3 000 | 2 000 | 1 000 | 0 | 5 000



LAKE COUNTY, INDIANA NO. 24

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial Photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 25

LAKE COUNTY, INDIANA — SHEET NUMBER 26

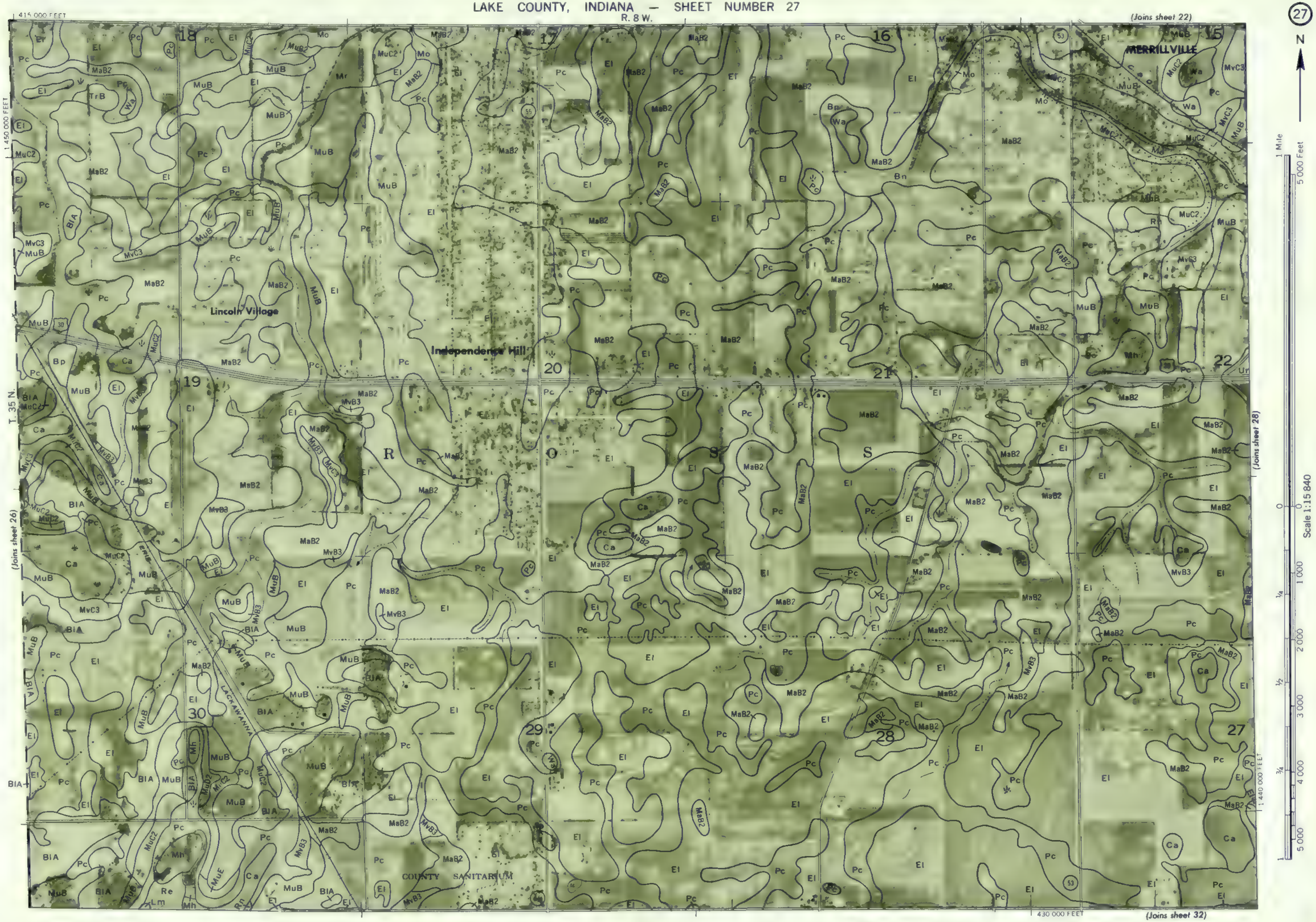
LAKE COUNTY, INDIANA NO. 26

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

LAKE COUNTY, INDIANA — SHEET NUMBER 27



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 27

LAKE COUNTY, INDIANA — SHEET NUMBER 28

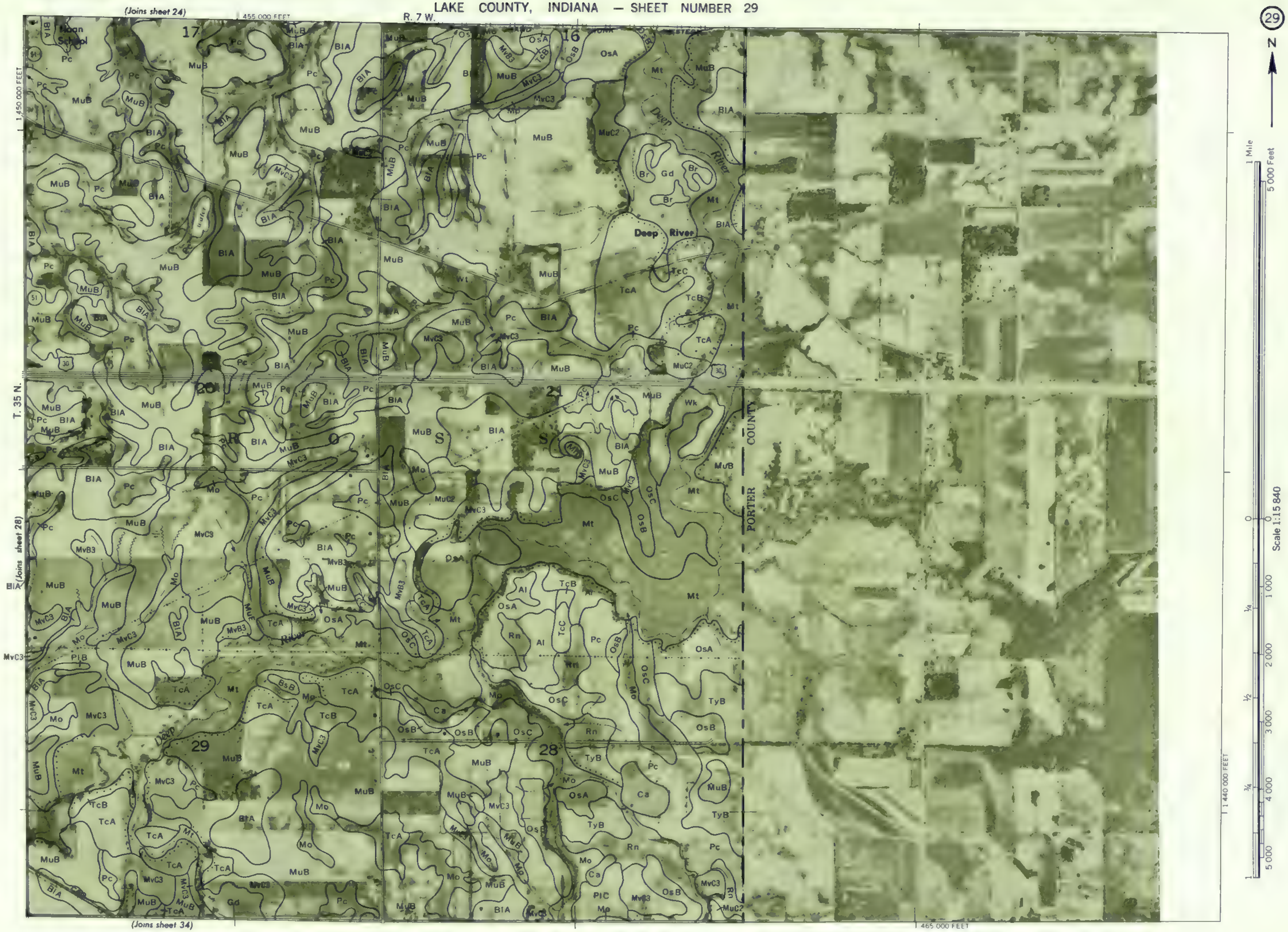
LAKE COUNTY, INDIANA NO. 28

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

LAKE COUNTY, INDIANA — SHEET NUMBER 29

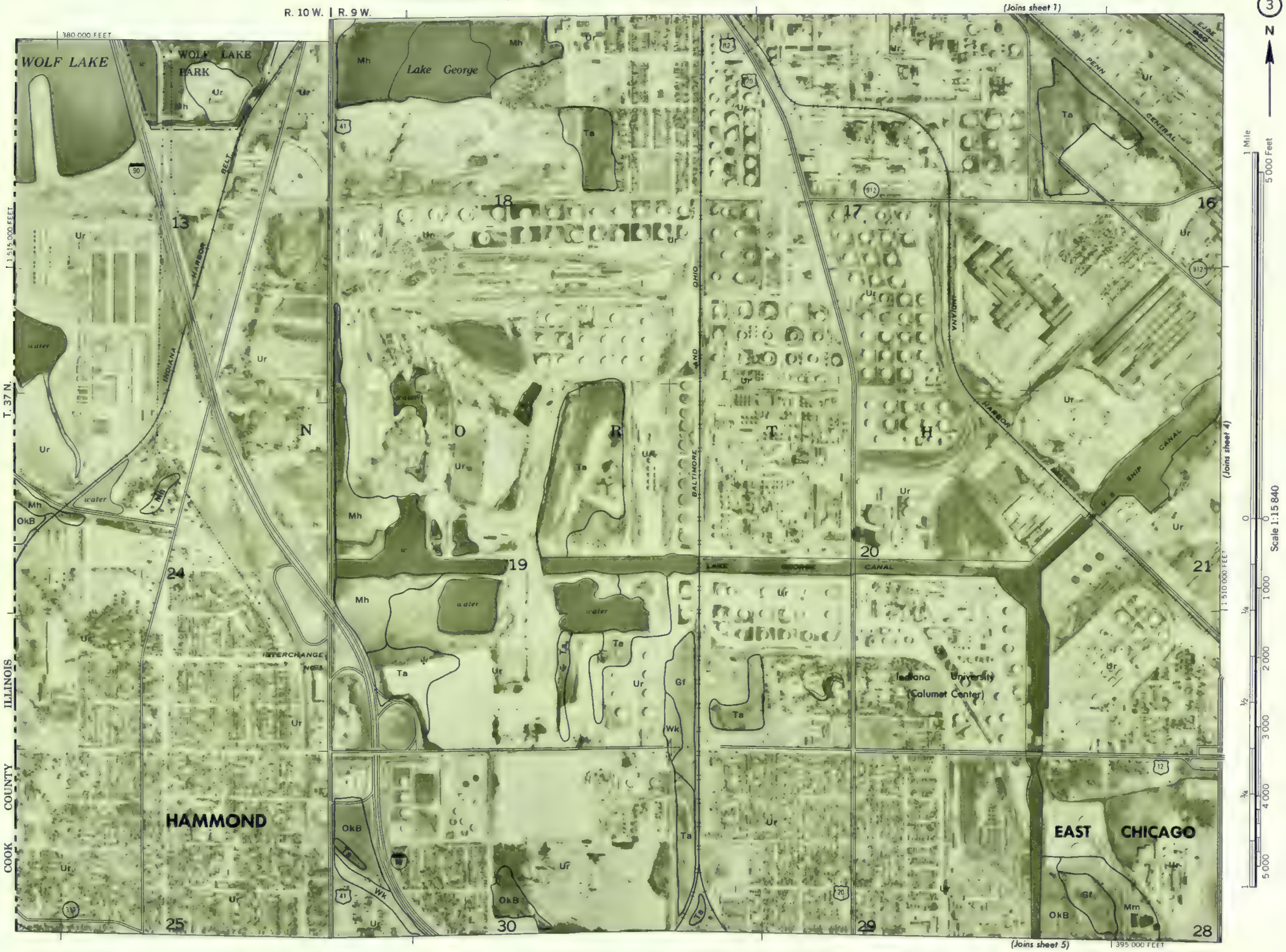


This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 29



LAKE COUNTY, INDIANA NO. 3

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial Photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

LAKE COUNTY, INDIANA — SHEET NUMBER 30

LAKE COUNTY, INDIANA NO. 30

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

LAKE COUNTY, INDIANA — SHEET NUMBER 31

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate

LAKE COUNTY, INDIANA NO 31

LAKE COUNTY, INDIANA NO. 32
Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

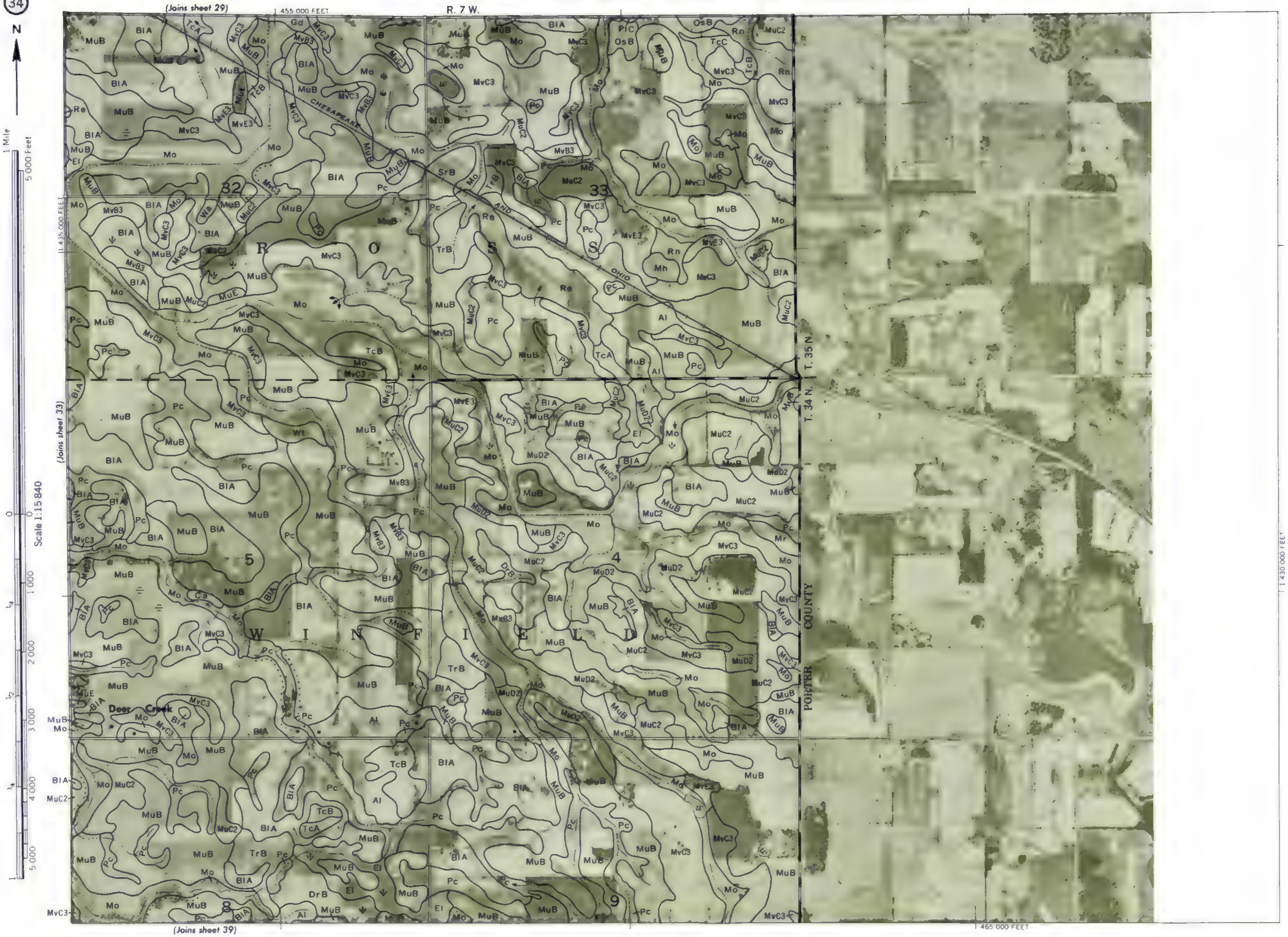
LAKE COUNTY, INDIANA — SHEET NUMBER 33

33

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

LAKE COUNTY, INDIANA NO. 33



LAKE COUNTY, INDIANA NO. 34

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

LAKE COUNTY, INDIANA NO. 35

LAKE COUNTY, INDIANA NO. 36

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system west zone.

LAKE COUNTY, INDIANA NO. 37

LAKE COUNTY, INDIANA — SHEET NUMBER 38

LAKE COUNTY, INDIANA NO. 38

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land divisions on corners are approximately positioned on this map

Photobase from 1965 aerial photography

LAKE COUNTY, INDIANA

LAKE COUNTY, INDIANA — SHEET NUMBER 4

LAKE COUNTY, INDIANA NO. 4

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system west zone.

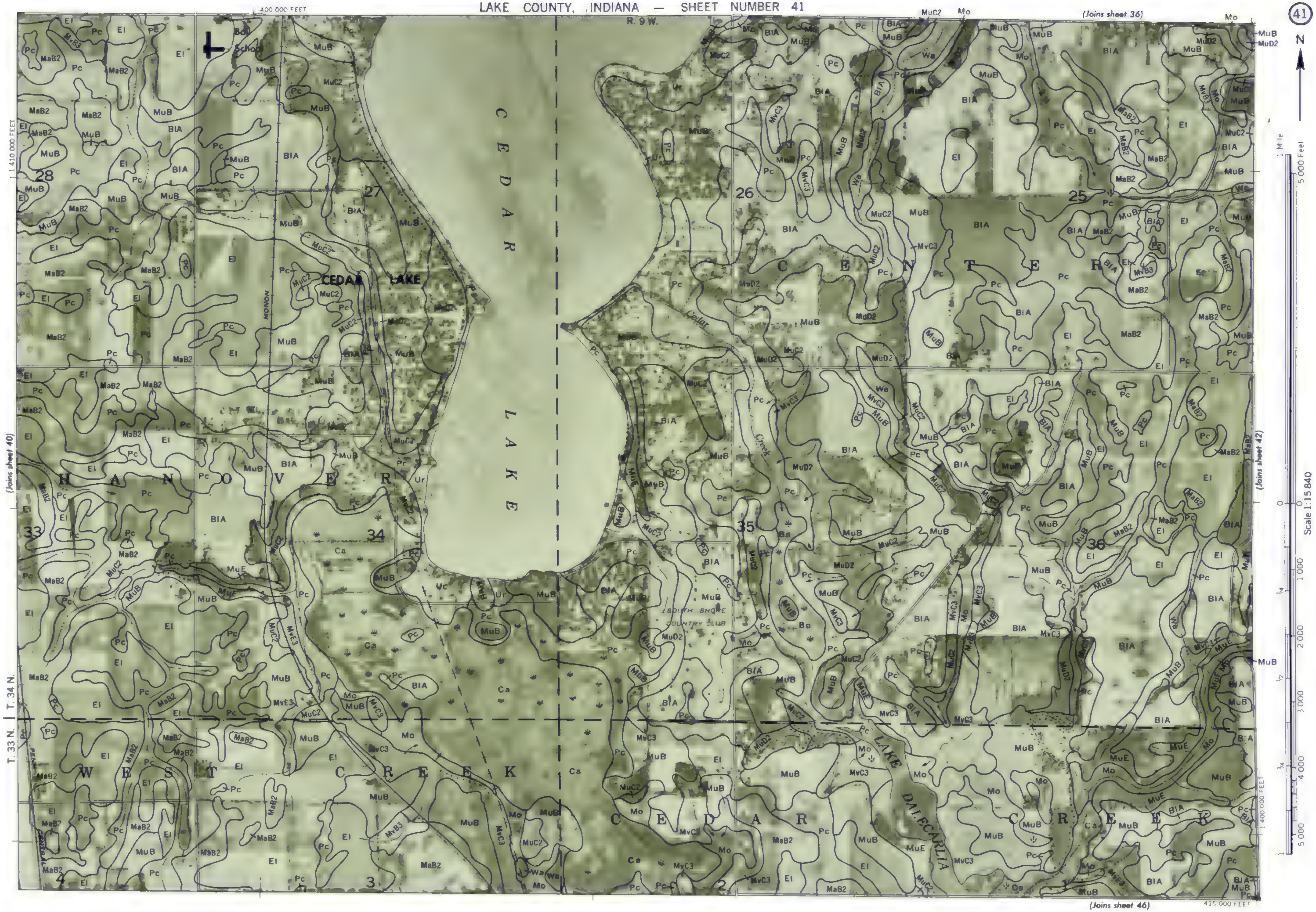
Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

LAKE COUNTY, INDIANA — SHEET NUMBER 40

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

LAKE COUNTY, INDIANA NO. 41

LAKE COUNTY, INDIANA — SHEET NUMBER 42

LAKE COUNTY, INDIANA NO 42

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

435 000 FEET

R. 8 W. | R. 7 W.

(Joins sheet 38)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 48)

450 000 FEET

1 410 000 FEET

1 400 000 FEET

T. 34 N. | T. 33 N.

N

Scale 1:15 840

1 Mile

5 000 Feet

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO 43

LAKE COUNTY, INDIANA NO 44

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Scale 1:15 840

1 Mile
5 000 Feet
0
¼
½
¾
1 000
2 000
3 000
4 000
5 000

LAKE COUNTY, INDIANA NO. 45

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system west zone

LAKE COUNTY, INDIANA — SHEET NUMBER 46

Photobase from 1965 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

LAKE COUNTY, INDIANA — SHEET NUMBER 47

(47)

N

Scale 1:15 840

1 Mile — 5 000 Feet — 0 — 1 000 — 2 000 — 3 000 — 4 000 — 5 000

0 — ¼ — ½ — ¾ — 1

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 47

LAKE COUNTY, INDIANA — SHEET NUMBER 48

LAKE COUNTY, INDIANA NO. 48

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.
Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 49

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 5

LAKE COUNTY, INDIANA — SHEET NUMBER 50

LAKE COUNTY, INDIANA NO. 50

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.


R. 9 W.
(Joins sheet 46)
(Joins sheet 52)
(Joins sheet 56)
(Joins sheet 50)
T 33 N
North Hayden
Lowell
W E S T C R E E K
C E D A R C R E E K
ST. EDWARDS CEMETERY
Cedar Creek
CENTRAL
BRUCE DITCH
MONON
21
22
23
24
25
26
27
28
33
34
35
36
415 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000

LAKE COUNTY, INDIANA — SHEET NUMBER 52

LAKE COUNTY, INDIANA NO.

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone
Land division corners are approximately positioned on this map
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

LAKE COUNTY, INDIANA — SHEET NUMBER 53

53

N

Scale 1:15 840

1 Mile

5 000 Feet

0 1/4 1/2 3/4 1

0 1000 2000 3000 4000 5000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land divisions on corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Indiana coordinate system west zone.

LAKE COUNTY, INDIANA

LAKE COUNTY, INDIANA — SHEET NUMBER 54

LAKE COUNTY, INDIANA NO. 54

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

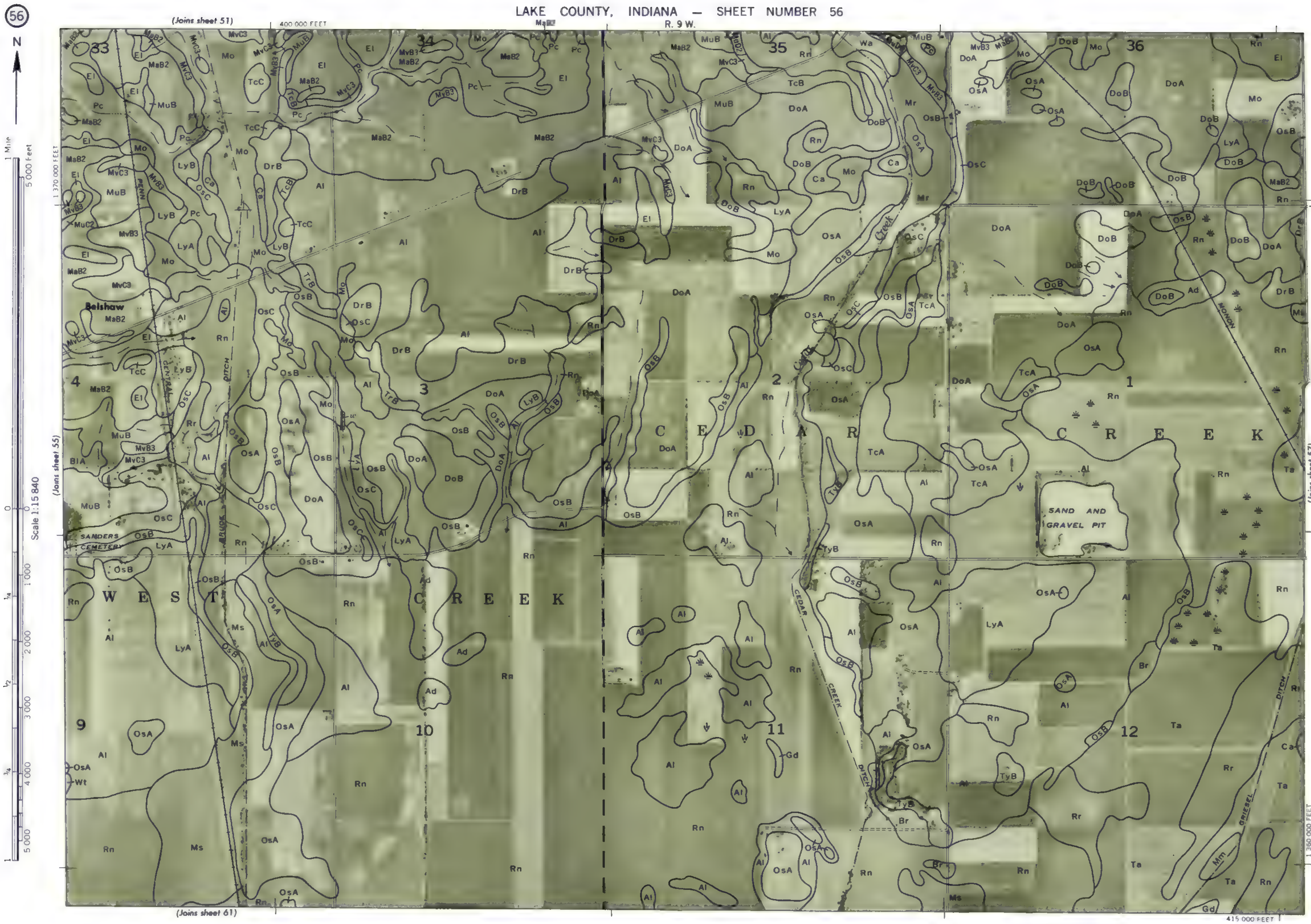
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO 55

LAKE COUNTY, INDIANA — SHEET NUMBER 56



LAKE COUNTY, INDIANA NO. 56

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

(57)

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

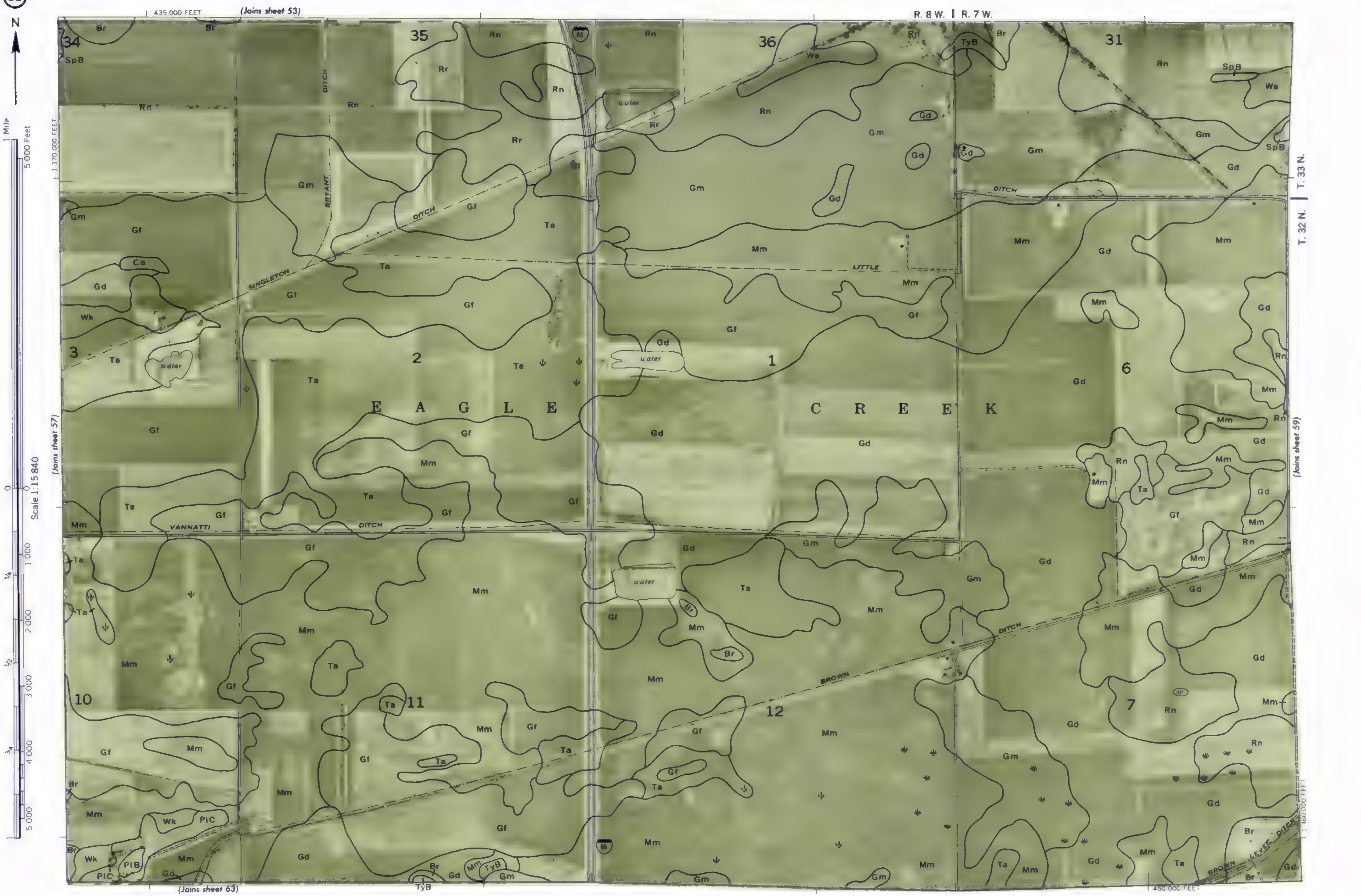
0 1 000 2 000 3 000 4 000 5 000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography   Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system

LAKE COUNTY, INDIANA NO. 57



Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system west zone.

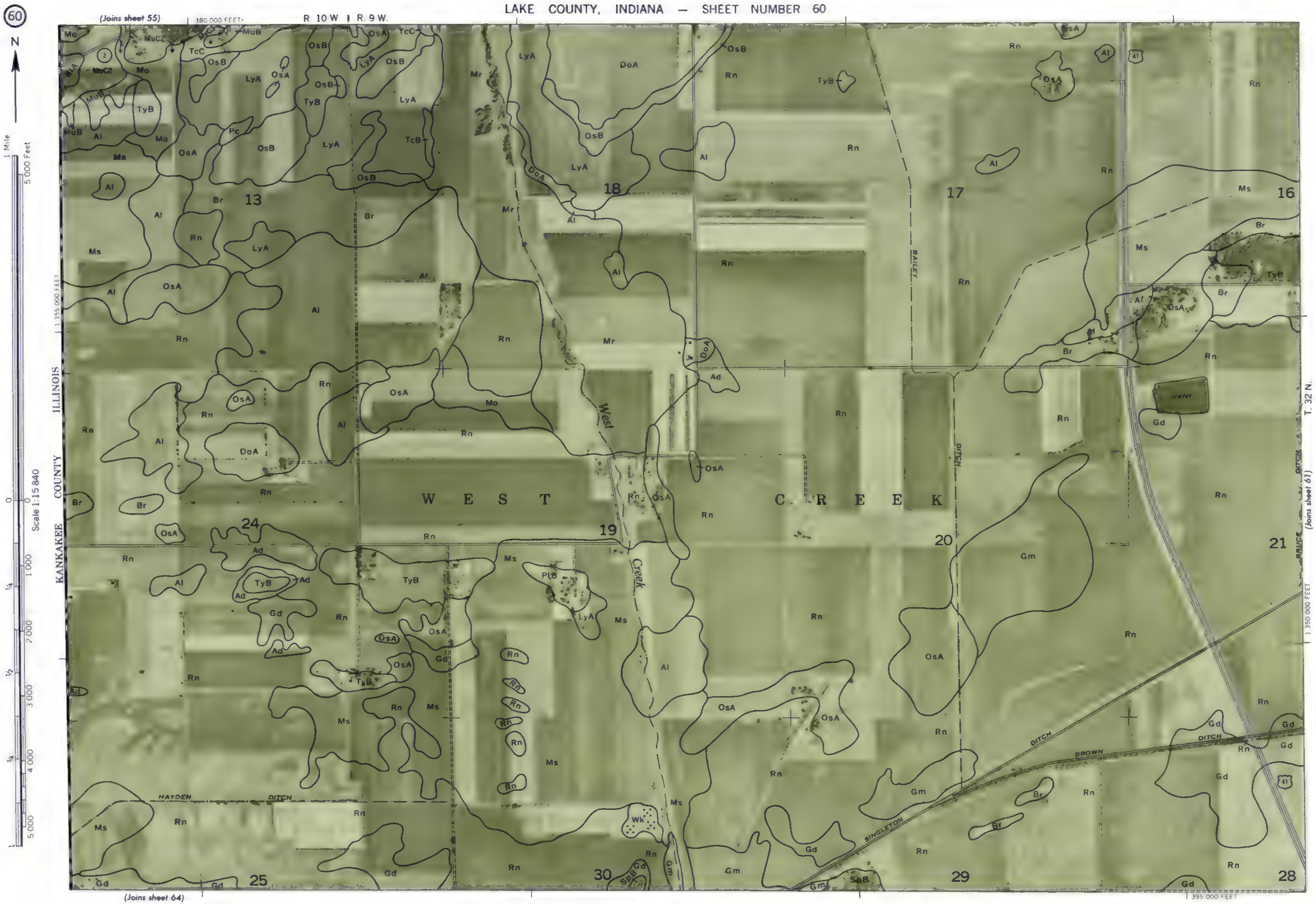
LAKE COUNTY, INDIANA — SHEET NUMBER 6

LAKE COUNTY, INDIANA NO. 6

Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station



LAKE COUNTY, INDIANA NO 60

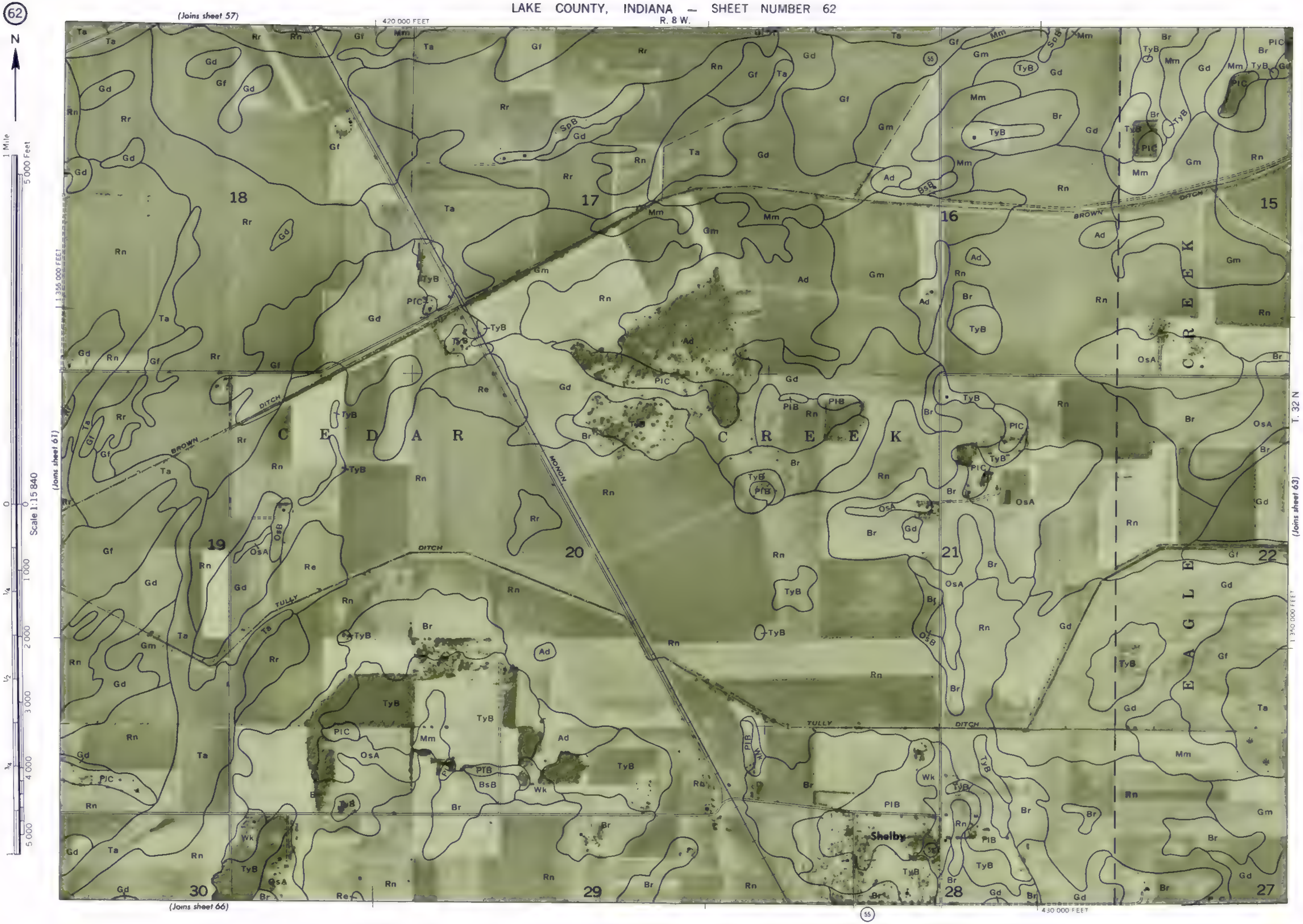
Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

Land division corners are approximately positioned on this map

Photobase from 1965 aerial photography

LAKE COUNTY, INDIANA — SHEET NUMBER 62



Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station

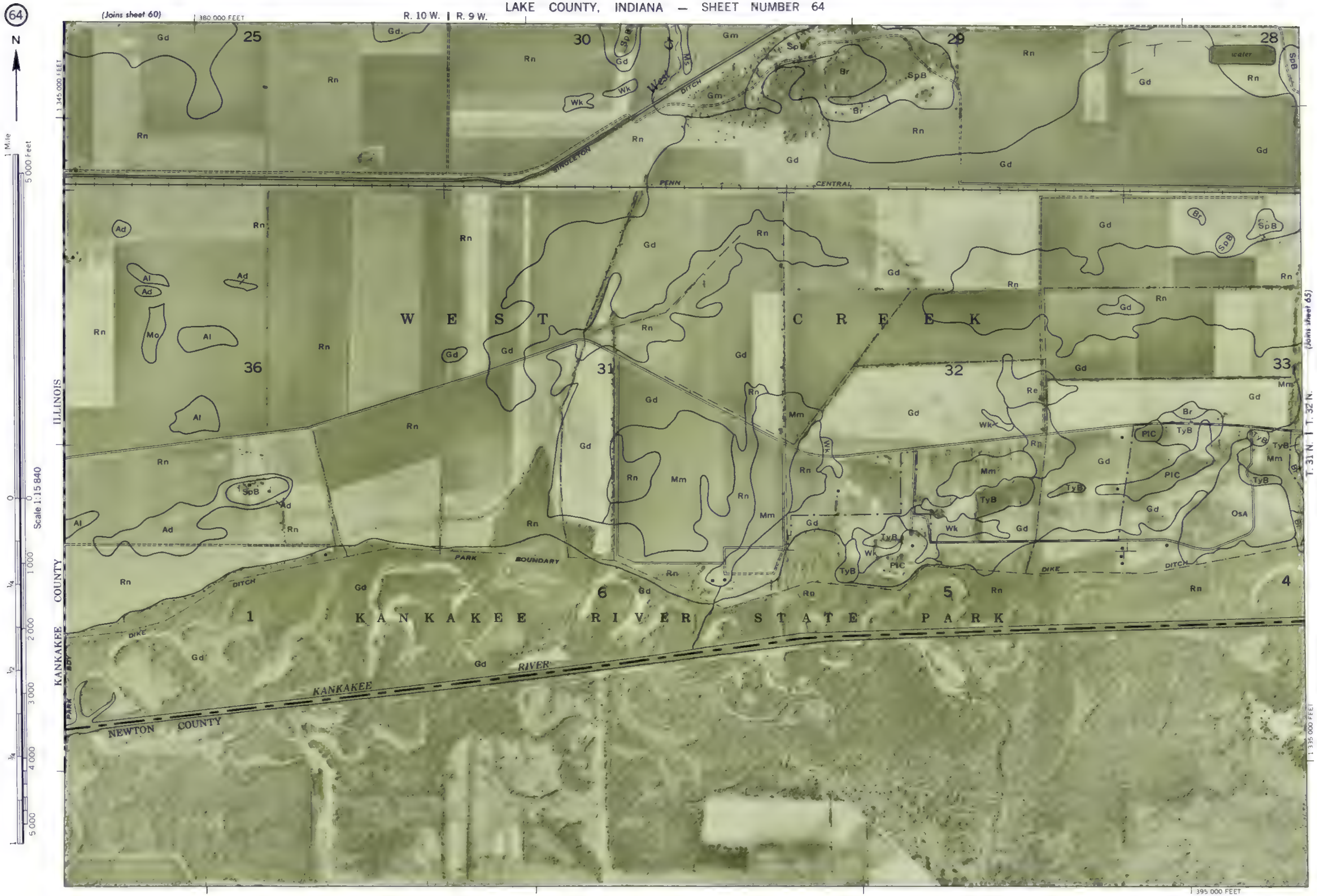
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 63

LAKE COUNTY, INDIANA — SHEET NUMBER 64



Photobase from 1965 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Indiana coordinate system west zone.

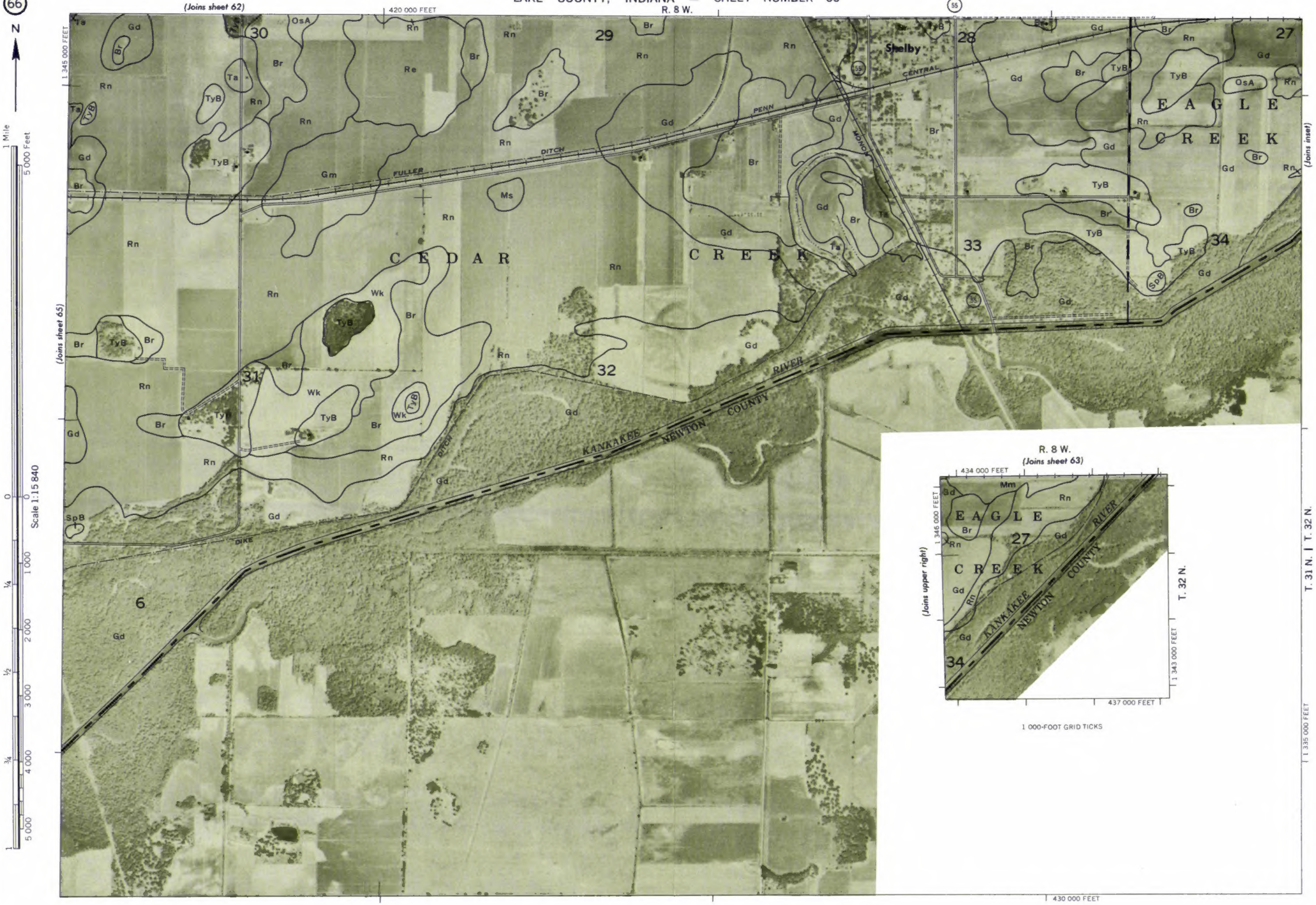
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural E... rnment Station

LAKE COUNTY, ...

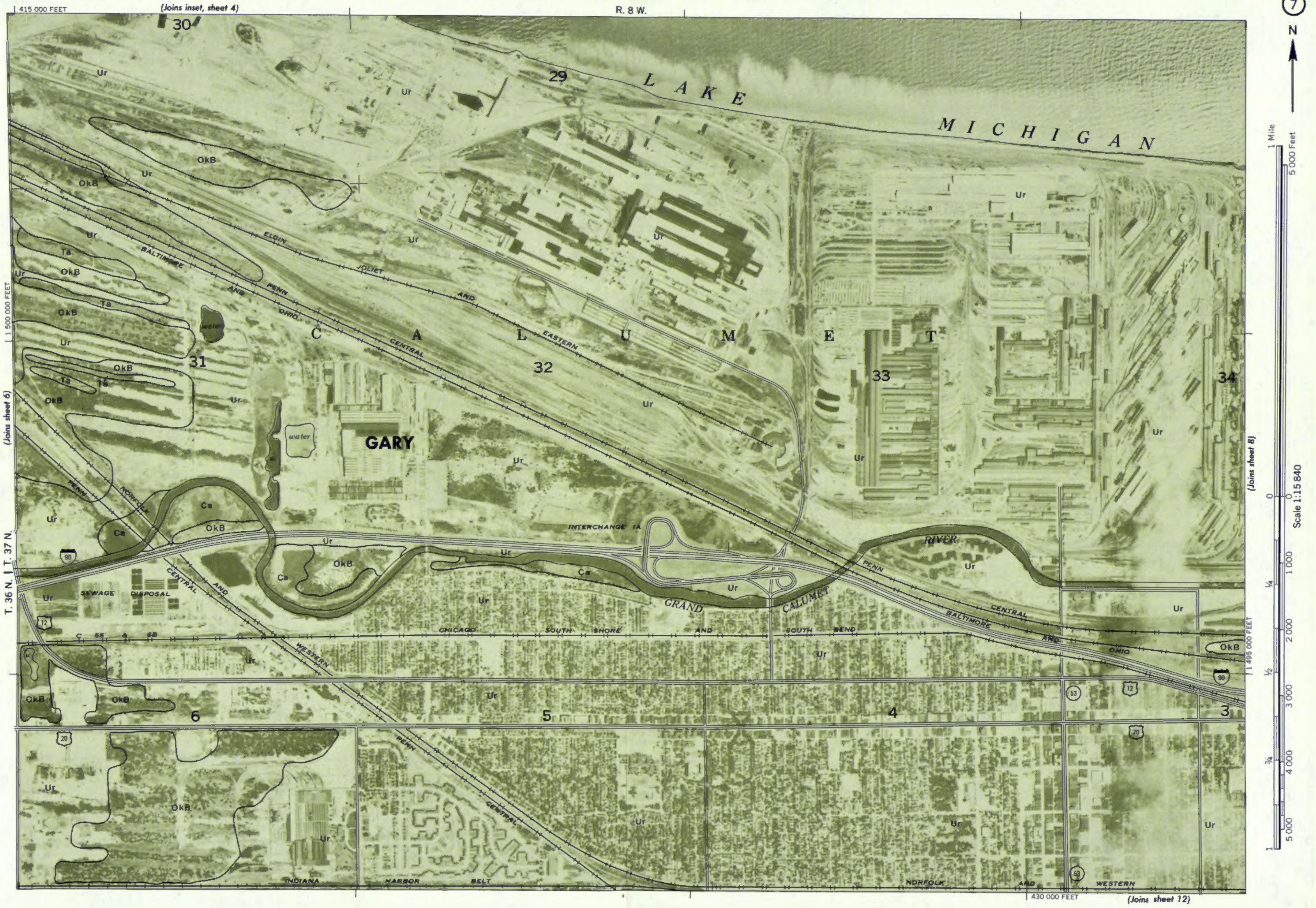
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.
Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA — SHEET NUMBER 66



LAKE COUNTY, INDIANA NO. 66

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system west zone.
Land division corners are approximately positioned on this map.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

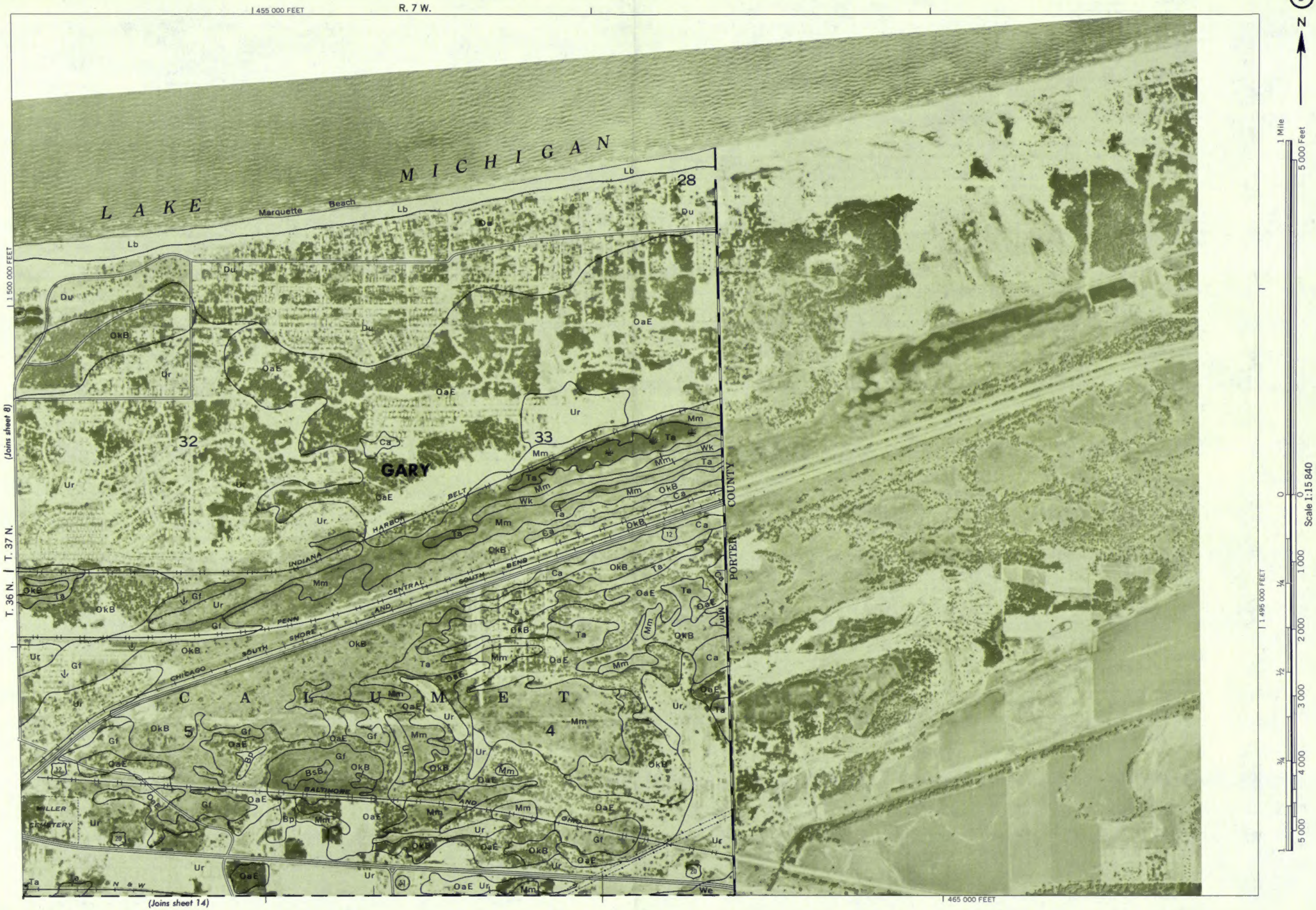
LAKE COUNTY, INDIANA NO. 7

LAKE COUNTY, INDIANA NO. 8

Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.
Photobase from 1965 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

LAKE COUNTY, INDIANA NO. 9